Digitized by the Internet Archive
in 2022 with funding from
University of Illinois Urbana-Champaign

https://archive.org/details/agriculturalstud1011unse

This volume is bound without v. 10, no. 4;
v. 11, no. 1 and 5

which is/are unavailable.

Price 1/- to Subscribers.
Price 2/-, with Portrait, to Non-Subscribers.

NEW SERIES.
Vol. X. Part 2. DECEMBER, 1900.

AGRICULTURAL STUDENTS' GAZETTE.

EDITED BY

STUDENTS AT THE ROYAL AGRICULTURAL COLLEGE,
CIRENCESTER.

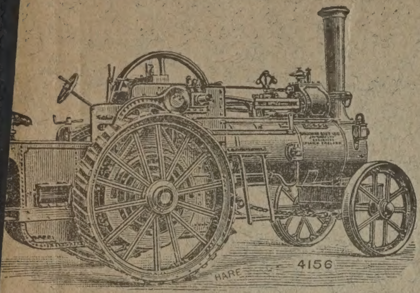
CONTENTS.

	PAGE
SIR JOHN BENNET LAWES, BART., D.C.L., F.R.S. By Robert Warington, F.R.S.	37
FARMING IN NATAL. P. W. Kimber	42
OF THOMAS TUSSER. "FIVE HUNDRED POINTS OF GOOD HUSBANDRY." L. Allen Harker	44
AGRICULTURE IN THE ISLE OF WIGHT. Henry Way, M.R.A.C....	48
AT THE FRONT	49
ROYAL AGRICULTURAL COLLEGE CLUB	50
LITERARY AND DEBATING SOCIETY'S MUSICAL ENTERTAINMENT	50
LITERARY AND DEBATING SOCIETY'S DRAMATIC ENTERTAINMENT	51
CHLORINE IN RAIN WATER. E. K.	53
OLD STUDENTS	54
OBITUARY	55
COLLEGE NOTES	55
FARM NOTES	56
STEEPLECHASE	57
GOLF	57
CRICKET	58
FOOTBALL	59
REVIEWS	64

ALL RIGHTS RESERVED.

CIRENCESTER: ALFRED T. HARMER, MARKET PLACE.

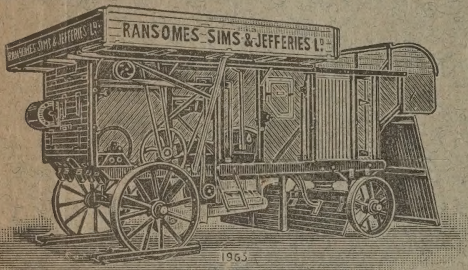
ANSOMES, SIMS & JEFFERIES, Lᴰ.



MANUFACTURE THE BEST

TRACTION ENGINES,
PORTABLE ENGINES,
VERTICAL ENGINES,
HORIZONTAL ENGINES
AND BOILERS.

Excellent designs, first-class materials and workmanship; ample strength in all working parts; large bearings and cylinders; ample steam space.

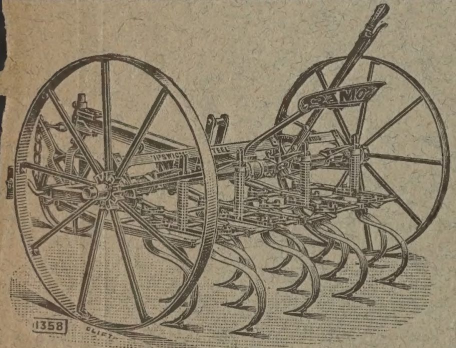


STEAM THRASHING MACHINES,

FINISHING THRASHERS,

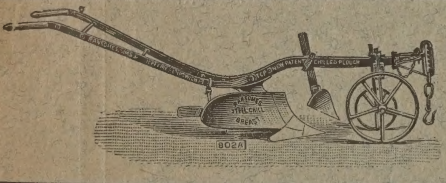
SINGLE-BLAST THRASHERS.

R. S. & J. have supplied Thrashing Machines to HER MAJESTY THE QUEEN and H.R.H. THE PRINCE OF WALES.



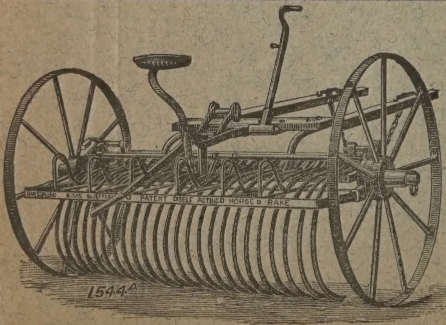
"THE IPSWICH"
STEEL CULTIVATOR.

THE STRONGEST, BEST, AND MOST PERFECT MACHINE IN THE MARKET. THE SPRING OF THE TEETH KEEPS EVERYTHING ALIVE. CAN BE FITTED FOR TWO OR THREE HORSES.



IRON AND WOOD PLOUGHS,
2 AND 3 FURROW PLOUGHS,
CHILLED DIGGING PLOUGHS.

R., S. & J., Ld., have been manufacturers of Ploughs for nearly a century, and the Chilled Plough Share was invented by Robert Ransome in 1803.


RANSOMES SIMS & JEFFERIES PATENT SELF ACTING HORSE RAKE
1544A

MANUAL DELIVERY RAKES,
SELF ACTING RAKES,
HAYMAKERS, etc.

R., S. & J., Ld., won the First Prize, £20, at the Manchester Meeting of the R.A.S.E. with their "Star" Horse Rake, and have since sold nearly 40,000 Rakes.

◆ ◆ ◆

FULL ILLUSTRATED CATALOGUES
FREE BY POST ON APPLICATION.

◆ ◆ ◆

ORWELL WORKS, I[illegible]WICH.

630.5
AGT
v.10

pt, 4 m-g

U. OF ILL.
JUL 15 1942
PER. DUPS.
COPIES

NEW SERIES.

Agricultural Students' Gazette.

Vol. X. AUGUST, 1900. No. 1.

WHEAT RAISING IN FOREIGN CLIMES.

By G. H. Nevile, M.R.A.C.

It has lately been my good fortune to visit two countries, Canada and Egypt, where wheat raising is carried on under very different conditions, and though the figures connected therewith cannot hope to compete in popularity with the cricket statistics in the current number of the *Gazette*, there may be some readers who will find them interesting.

A greater contrast in agricultural conditions it would be hard to find than between Egypt and Canada. Egypt is a land of dense population, concentrated in a few thousand square miles of rich alluvial soil. Canada has a smaller population, spread over millions of acres of mountain, prairie, and forest. In the one case the husbandman tills a soil of almost inexhaustible richness, with much the same methods as his forefathers have used any time during these last 5,000 years, and with the aid of a never failing sun takes two or even three crops a year from the land. In the other case, on the virgin prairies the Western farmer brings the latest agricultural implements to snatch a hasty harvest from "Our Lady of the Snows." Yet in the end it is the boundless energy of our Northern friend which provides the cheapest wheat for our markets, and it is here that the budding Protectionist (and what English agriculturist is not this at heart) must first study the conditions of cheap wheat production, that he may decide whether 6d. or 1s. a quarter is the duty which is to bring back the good times of English farming.

It is not necessary to point out to R.A.C. men that most estimates of wheat culture in England place the cost of the year's disbursements at about £4, when rent, rates and taxes, interest on capital, and all other expenses are added to the general labour and manure bill. Against this we cannot set a higher average than 32 bushels per acre, which gives us an initial cost of 1s. 10d. to 2s. 6d. per bushel. How, then, does it happen that countries producing only 20 bushels to the acre can send their wheat some 4,000 or 5,000 miles it may be to compete with ours in our home market, we may ask. Let us take the case of a typical settler and follow him over his farm in his work, and we shall see.

The greater part of the wheat grown in Canada for export is produced in Manitoba and the North-West Territories. Here we have wheat, wheat, and nothing but wheat, and in a season like the past the greater portion of it grading "No. 1 hard."

Let us locate our typical settler in the N.W.T. anywhere within 20 miles of a railway station, and surmise that he is not breaking up his land for the first time, but has got the whole of his "quarter section" of 160 acres into working order. The cash capital he invested on his farm in the first case was probably not more than £120-£150, and this went for the purchase of implements, wood for his house, horses and cattle. His land was a free grant to him subject to the payment of a registration fee of £2 and the fulfilment of certain homesteading duties during the first three years, and he is now the proprietor of house and land and in the best possible position to produce wheat cheaply. The man himself is of the labouring class, a Russian, Austrian, or German peasant it may be, or it may be a hardy Scotch crofter or the son of a Canadian farmer in the Eastern provinces.

We are assuming that our settler does all the work on the farm himself with assistance only at harvest, though if he has a son of 12 or 14 years of age his work will be considerably lightened, and more land may be brought under wheat each year.

One man working by himself cannot keep more than 120 acres of land in cultivation for wheat, and his quarter section, let us say, in April will be laid out as follows:

There will be 40 acres of prairie on which stands his house, stables, his patch of potatoes, and if he is enterprising a small garden for "truck." Another 40 acres will be last year's summer fallow, and his first care when the snow goes will be to get this sown as soon as the land is workable. If his land is clean he will drill another 40 acres of wheat straight on to last year's stubble, and the firm seed bed he here obtains will give him a better crop than if he had worked the land.

His land may be foul, however, and in this case if he has not taken time by the forelock and given a preliminary ploughing before the winter frosts, he will have all his work cut out to get a crop in before it is too late.

Thus during April and May he has sown 80 acres with wheat, and he gives the crop no more of his attention until harvest brings its onerous duties in August. Meanwhile his time is occupied in summer fallowing the remaining 40 acres of last year's stubble, and this in addition to ploughing receives as many cultivations or harrowings as he has time to give it to preserve by the aid of a dust mulch all the moisture of the melted snows and the scanty rains of spring. This summer fallowing is an essential feature, we might almost say the essential feature, of successful farming in this part of Canada, where the average rainfall over large districts is not more than 8″ to 12″, most of which is in the form of snow, with what little rain there is falling in the months of April, May, and June. It may sound strange to English farmers, but cases are on record in Canada of successful crops being grown without irrigation on which no spot of rain fell from the time they were sown until they were harvested. One such crop of oats on the farm of Mr. T. Greenway, late the "Farmer Premier" of Manitoba, averaged 70 bushels per acre. This is due entirely to careful summer fallowing.

The remainder of the summer is occupied by our settler cutting the succulent prairie hay from the slews or shallow depressions into which the snow water has run and which consequently give a liberal hay crop. No extensive haymaking is required, as the hot sun will cure all his hay as it stands. Besides this he has his stock, his garden, his potato patch to attend to and finds every minute fully occupied. In harvest he gets a hired hand to help him for some six weeks or two months, and for this he has probably to pay $25 to $30 a month with board and lodging. Some 10,000 of such casual helpers were shipped by Government aid from the eastern provinces and townships to assist in the western harvest at reduced fares for the return journey.

We hear sometimes of scarcity of labour at harvest time in the Fen districts of Lincolnshire, two hours journey from London by a fast train. In Manitoba the farmer hires a shopkeeper or factory lad from 1,200 miles away, and the latter looks upon the outing as a holiday and dreams of taking up a farm for himself.

Thrashing and marketing his grain are all that now remain for the farmer and these are soon accomplished. If he is a friend of the owner of the thrashing machine and can secure an early visit from the latter he will probably have his wheat thrashed straight from the stook. The thrashing gang provides some 20 or 22 men, and probably 8 waggons and teams for this work, and the farmer will have to find all men and horses in food and fodder while on his farm. As, however, 1,500 to 1,800 bushels is an average day's thrashing, the produce of his 80 acres will not take more than a day or a day and a half to work through. If the machine comes later in the season, the settler will probably have carted his wheat into unthatched ricks in the field, and as he has only some 12 or 14 men and some 2 or 3 teams to feed, and has lost less grain in the carting than would have been the case had he thrashed direct from the stook, he often considers that the former is the better paying method. As regards the cost of thrashing, this varies from 3 to 6 or even 7 cents a bushel. As a rule 4 cents or 2d. a bushel is a fair average, and many owners of machines charge 4 cents whether thrashing from the stook or rick right through the season.

The straw is burned as fuel in the engine, and though some of the remainder is probably drawn into a rough stack for the stock to feed on in winter the rest is generally burned in the field.

As for marketing, his market is near at hand at the nearest railway station, where the grain elevator is prepared to pay him the current price or store his grain as he may require.

It is Liverpool that controls the market, and day by day the Chicago and Fort William prices vary with Liverpool, and every elevator in the west follows suit.

Now comes the important point: what return can the settler expect from his labour and at what price can he put his wheat on the market and still make a living wage. He has eighty acres under crop and we are assuming that he has an average crop, that is to say about 20 bushels to the acre; he has therefore 1600 bushels of wheat for disposal.

UNIVERSITY OF
ILLINOIS LIBRARY
AT URBANA-CHAMPAIGN

At the time I was in the North-West, in October and November last, wheat was averaging some 50 cents per bushel about 300 miles west of Winnipeg. That is to say selling his wheat at 16s. per quarter the farmer was taking £160 on that crop alone. Of this he probably would have to expend £25 on outgoings, half in harvest labour, one man two months = £12, and another £12 for his thrashing account.

In addition to this income from his wheat he can probably make enough in milk, butter, poultry, and garden produce to keep himself and family in food and groceries through the year, and he lives rent and tax free. Many an honest English labourer would be satisfied with £50 a year as a result of his year's work in place of the £135 made by the settler if he could live under similar conditions.

At the same time it is only fair to Canada to state that the figures here given are not such as would be published by the immigration department. An official of that department would point out that a man and young lad together could well work a half section of 320 acres in place of the 160 taken as a standard; that 22 bushels per acre more nearly represents the result of a good average year's crop, and that the price quoted, namely, 16s. per quarter, representing about 24s. at Liverpool, is a low one. Indeed it is only fair to say that one had only to stand outside any elevator in the North-West for an hour or two during the last season to hear of several 2,000 bushel crops reported by their happy owners.

When we come to compare Canadian with Egyptian figures for the cultivation of an acre of wheat we find that if all the items of labour were paid for at hired labour prices 35 cents per bushel would be the total cost. That is to say, the settler is paid liberally for his labour, and has 15 cents per bushel in excess. He cultivates a large tract of land with improved machinery, and the land has only one family to support. The settler is his own labourer, farmer, and landlord, and the general public as represented by the rate and tax gatherer only has an interest in his holding to the extent perhaps of six or eight dollars for school tax. Thus it is that wheat is produced at 16s. per quarter, and could indeed be produced at 8s. if the settler were satisfied with £75 for his year's labour.

Let us now turn to a country where wheat is grown under almost exactly opposite conditions to those which prevail in Canada.

The first thing which strikes one in Egyptian agriculture is the absolute absence of grass. Not a patch the size of a Devonshire pasture is to be found to take the place of the Canadian prairies, and a few scattered trees, none of them more than 40 years old, if we except the date palms, take the place of the Thujyas of British Columbia, and the pines of the Laurentian hills. A prehistoric plough and his universal hoe and sickle serve the fellah in place of the sulky plough, the disc harrow, and the self-binder of the Canadian farmer. With these and a yoke of oxen he cultivates his five or ten acres, and is ready to pay £4 or £5 or even £12 per acre for so doing. Egypt is the land of the agricultural capitalist, Canada of the man whose capital is in the sweat of his brow. With capital the Egyptian agriculturist can make thousands where the Canadian makes hundreds, without capital he will starve where in Canada he would earn a handsome wage.

True, Egypt cannot be considered a competitor in our home wheat markets, as she herself requires all or nearly all she grows, but at the same time if one may take the cost per bushel or per acre as illustrating conditions which prevail in some sub-tropical countries we shall get something to compare with Canadian figures. In Egypt as elsewhere the quality of the land and local conditions vary considerably, so that figures given here can only be taken together to represent conditions which actually prevail on some of the more newly cultivated lands of the Delta.

In Canada we saw wheat as the paying crop, and taken twice in three years with a third of the land left fallow. Here wheat is taken once in two years, and forms one of four crops taken in that time. For more southern parts, and on a better quality land, it would form but one of six crops. Cotton is the paying crop of the rotation here, and is in the ground from March to November. Wheat sown any time after November 15th is harvested in May. Rice follows the wheat, and thus once in every two years the land is thoroughly washed, to keep down salt efflorescence; the rice is followed by berseem, the local clover, which is cut every forty days till the land is ploughed for the new cotton crop. With beans or barley taking the place of some of the wheat, and maize or sorghum or other forage crops occupying part of the cotton break, this may be taken as a rough scheme of an Egyptian rotation.

We have looked at Canadian wheat raising from the point of view of the settler, the working farmer, let us therefore take the fellah and not the large proprietor as our standard in Egypt. His holding is probably 5—15 acres in extent, and includes some cotton land and some rice land, the estate being probably divided in halves for these crops for irrigation purposes. Let us take ten acres as a mean average for the holding, and say that with his wife or wives and family he cultivates this.

His capital consists of his pair of oxen or gamoose (the native buffalo), his plough, and perhaps a norag, or machine for treading out the corn, and one or two smaller hand implements, total value perhaps £35. His house, so called, may cost anything from £1 to £10, the latter being a very superior dwelling of burned bricks and some timber, but I have heard of a very elegant mud mansion with first-class river frontage, slightly in want of repairs, as the house agents would say, on offer at 18 piastres, or 3s. 8d.

To apportion a rent to the wheat land we must consider the returns of the whole rotation, which we may take as follows:

£10	per acre for the	cotton crop.
£5	,,	wheat crop.
£3	,,	rice crop.
£3	,,	berseem crop.

In all £21 in two years.

The rent is possibly £8 on the cotton break, and £2 on the rice land, or an average of £5 per annum, the landlord taking the two crops mentioned and selling them on behalf of the tenant after deducting rent. Of this £5 rent $\frac{5}{21}$ or say roughly £1 5s. may be set to the account of the wheat land.

From this rent of £5 per acre the landlord will have to pay a land tax of about £1 per acre, and probably also raises all water for irrigation purposes where necessary.

The fellah's receipts for the year on his ten acres may be as follows:

5 acres wheat, 5 ardebs (1 ardeb = 5·44 bushels), at 80pts. = £4 per acre	£20
Wheat straw, used as food for cattle	5
5 acres rice, at £3, deduct £2 taken for rent	5
5 acres cotton, 5 cantars at £2 = £10 per acre. Deduct £8 per acre rent	10
5 acres berseem, value as food for cattle and a sheep or two, &c., at £3	15
Total	£55

That is to say, where the Canadian farmer made £130 on his 160 acres of rent free land, the fellah makes £55 on 10 acres, and pays £50 rent in addition. True, to the Canadian farmer £55 would not seem untold wealth, but the wants of a fellah are few, necessaries are cheap, and when compared with the working wage of the ordinary day labourer, which is 2 piastres, or 5d., at the time and place I write from, the difference between £55 and £13 per annum is great enough. Indeed if he could see his way to this much return per annum, the fellah would probably invest in another wife or a half-share in a gamoose, and rent another acre or two on which to find work for his new purchase. Like other commodities wives have their ups and downs in the market, and after a good cotton crop last year, "wives is riz." In the language of the cotton market, "ordinary brown" are meeting with good demand at £8; "middling fair" quiet at £10; while "extra fair and good" are steady at £12 to £16. In the lower qualities, "fair but flighty" are dull at £6, or less. A gamoose on the other hand costs £14 to £18, a horse (by no means the Arab of the picture book) £5 to £12, a good mule £20, chickens 5d. to 7d. each, eggs, 12 for 2½d.

The labourer's wage mentioned above is exceptionally low, and 3pts. in the country and 4pts. in the neighbourhood of towns would be a fairer average. As in the case of Canada, figures and prices here given do not represent by any means the best Egypt can produce, and indeed refer to second class land lately reclaimed from salt wastes. Crops of 11 ardebs (60 bushels) of wheat and 9 or 10 kantars of cotton are not out of the way for the best land and lucerne cropped though the year has yielded, it is said, as much as 80 tons of green fodder. On such lands a rent of £12 an acre is not surprising.

In conclusion we will compare the cost of one acre of wheat cultivated entirely by hired labour in Manitoba and Egypt. In both cases the wheat reaches the retailer or consumer in the local market in Egypt or at Liverpool at very nearly 24s. per quarter.

Manitoba.

	s.	d.	£	s.	d.
Once Ploughing			0	5	0
2 Harrowings			0	0	10
2 Cultivations			0	1	8
1½ bushels Seed			0	3	0
Drilling			0	0	11
Harvesting—					
Binding	1	4			
Cord	0	10			
Stooking	0	8	0	8	10
Stacking	2	6			
Thrashing	3	6			
Teaming 4 miles			0	1	2
1½ Years' Interest on Land worth say £3 @ 6%			0	5	0
Cost per acre			£1	6	5
Cost per bushel			0	1	4
Value 20 bushels @ 50c. = 2/1			£2	1	8
Profit of cultivating 1 acre			0	15	3

North Delta, Egypt.

	s.	d.	£	s.	d.
2 Ploughings (= 1 thorough)			0	6	8
1 Harrowing			0	1	3
1 Clod Crushing			0	1	0
Sowing broadcast			0	0	6
1¾ bushels Seed			0	6	5
Labour of 3 Irrigations			0	1	3
Harvesting—					
Reaping	1	8			
Thrashing with Norag	6	8	0	11	7
Cleaning and Winnowing	3	3			
Carriage, one Mile			0	0	4
Rent, includes Taxes, Duty for Water, &c.			1	5	0
			£2	14	0
Cost per bushel			0	2	0
Value 27 bushels @ 80pts. ardeb = 2s. 10d. per bushel			3	16	6
Straw, 3 camel loads			1	0	0
			£4	16	6
Profit of 1 acre			£2	2	6

HANKOW AND NEIGHBOURHOOD.

Hankow is the chief town of central China, and is destined in the next century to develope into a place of the greatest importance. Although 600 miles from the sea, every spring large ocean steamers ascend the Yangtze river to Hankow, and there load up with tea to be transported direct to Europe. The railway from Hankow to Pekin is in course of construction, and that to Canton has been surveyed, and the final negotiations for its construction are in course of arrangement. These two lines will add greatly to its importance.

The general impression produced by the country from Hankow to the sea is that of a vast level of river deposit, through which the tops of isolated mountains and districts of mountainous country protrude like islands in a sea of mud. The river here, which is still 2,500 miles from its source in Thibet, is quite brown in colour, being full of fine suspended matter, including fine mica flakes; the rise and fall between summer and winter levels is about 40 feet, and in summer the river floods enormous areas of lands on which it deposits its mud; in consequence of this the flat land is full of innumerable lakes, whose size is constantly changing with the rise and fall of the river. It is curious to notice that where a channel connects the river with a lake a delta is formed stretching into the lake; for as the water runs in from the river it is full of suspended matter which is deposited, forming the delta, and as it runs away it takes little or no solids with it.

CLIMATE.—The year's course of weather begins in February with cold rain, sleet and snow, which rarely lies long, and occasional frosts sufficient to form ice on the ponds; in one year now and then there is quite a severe spell of winter weather, the snow and ice lasting for weeks. In the middle of March spring weather begins; the temperature rises in a series of waves each of a week or two's duration, the days get warmer and warmer until it is quite summery, then down goes the temperature with a sudden drop, a high wind or heavy rain comes on and it is quite cold again, then the wind and rain stop and another rise of temperature takes place, to drop as the previous temperature wave did. This goes on until the end of June, the average temperature rising all the time, and the rains being followed by a warm damp atmosphere, which makes all leather or pasted articles blossom out green with mould. July and August are fearfully hot, the temperature not often falling below 80°; they are relieved by occasional thunderstorms, which cool the air. At the end of August the summer departs; and in the months from September to January the air is dry and the weather perfect, with the exception of occasional rainy weeks. This is the general type of weather for the year, though some years are exceptionally dry or exceptionally wet.

LAND.—The hills are very dry and barren, and yield little but coarse grass, which is cut in the autumn for fuel; to afforest them would improve the country enormously. The rising ground of lower elevation carries a crop characteristic of the country, and that is graves, graves, graves for miles and miles in the neighbourhood of towns, sparser in the country. To a Chinese his funeral is the most important event in his life! The *fêng shui* of the graves of the ancestors, that is, their situation with regard to the surrounding country, determines the prosperity or ill fortune of the descendants. Coffins are often kept unburied for one or two years until the sons can afford to give them a really satisfactory funeral. The graves present a difficulty to the railway engineer of a magnitude an European would never imagine. The depressions between the low grave-clad elevations are occupied by numerous small fields, separated from one another by narrow paths and small ditches, and watered from small ponds every here and there. Of hedges and fences there are practically none, except near houses. The plain land is also cultivated. The houses are mostly clustered together in small hamlets, and not scattered over the land. Near the hamlets a few trees are to be seen, otherwise the country is very treeless. The land is sometimes owned by the farmers, and sometimes rented from landowners who live in the towns.

ROADS.—One of the great needs of the country is roads to facilitate transport. There is nothing that would be called a road in England; the main lines of traffic are nothing but broad footpaths in a very bad state of repair. The carriage of goods is effected mostly by coolies, who use a carrying pole on their shoulder, from the ends of which are suspended two large baskets; wheelbarrows of a peculiar construction are also used. The use of horses for transporting goods is unknown, the roads are quite impassable for carts. Travellers either walk, or ride horses, or use sedan chairs carried on the shoulders of two, three, or four men. The numerous lakes or waterways supply to some extent the want of roads. In the north of China carts are used.

Crops.—Rice is grown on those fields which can be covered at will with water by various irrigation methods; as a rule the land which the river floods is not used for rice, because the river deposit is prejudicial to its growth. Two crops of rice are obtained in the same year from the rice fields. A very peculiar object in the country is a machine for raising water from ponds to higher levels; imagine a long inclined trough about 9 inches wide with one end in the pond and the other over the channel into which the water is to be raised; imagine an endless chain of wooden links running up all along in the trough and then passing round above it, and so down to the bottom again; on this chain are fastened, a few inches apart, a number of small square wooden boards at right angles to the chain which passes through their centres, these boards thus fit into the trough. When the chain is made to move up the trough and then round a small wheel down again, the boards scrape the water up the trough and discharge it at the top. It is wonderfully efficient in its action. Winter wheat and winter barley is sown in the autumn and reaped in the following spring, it is then followed by beans, and then by buckwheat, all in the same year. The beans are soaked, ground, boiled, strained, and the liquid is precipitated with solution of gypsum; the resulting bean curd is a common article of food. On the land subject in summer to river floods winter wheat and barley are grown, if it is not too sandy. A tall millet is grown and is fermented, and a spirit is distilled from it. Sesamum is grown and the oil is largely used for cooking purposes. Other crops are earth nuts, sweet potatoes, indigo, and cotton; the cotton is rather short in the staple and wants improving. Hankow is the great market of the tea trade, but the tea districts are 100 miles or more away from it. The Chinese merchants there sell it to the foreign firms in May and June. There are several large Russian firms there who buy up the most expensive varieties for the Russian market, the Russians being willing to give high prices for exceptionally good teas, whilst the English are not connoisseurs in tea. The Russians have also in Hankow some manufactories for making brick tea. In 1897, 24,000 tons of tea and 29,000 tons of brick tea were exported from Hankow The profession of Chasee, or tea-taster, can be recommended to any student with suitable gifts who is looking out for a career. The Chasees come out from England in the spring, and return in the summer, and have little to do for the rest of the year. They have thus two pleasant voyages, and sometimes get about £1,000 a year. During the tea season, though, they are very hard worked, not a moment of daylight must be wasted. Their work consists in tasting and examining the appearance of the tea samples, and then estimating their value;

on the basis of this estimate the bargain is made with the Chinese seller.

Stock.—Cattle and water buffaloes are kept and do all the ploughing, but the Chinese never use the milk, and their slaughter for food is prohibited on sentimental grounds. As they are good servants and plough the land, it is not considered right to kill them. In the treaty ports some are killed to provide beef for the foreigners, but in the country any beef in the market has probably died a natural death. The Chinese in the treaty ports are now acquiring a taste for milk. The meat of the country is pork, and pigs are a prominent feature everywhere, both in town and country. The native sow is said to produce an exceptionally large number of pigs in a litter, and some have been bought to be taken to the United States to improve the breed there in that respect.

Of sheep there are very few; they are used to supply the Mahomedan Chinese (who are not numerous, however) with meat, as they must not eat pork.

Horses are only used for riding, very few are bred locally, but numbers are brought from Mongolia for sale in Hankow, they are all small, 13 hands or so. They cost from £2 to £8. Mules are more valued by the Chinese than horses, and fetch higher prices.

Fowls are kept in abundance, and the raising of ducks in large flocks on the lakes is a special industry. The Chinese are very successful at artificial incubation carried on with very primitive apparatus. In the last few years advantage has been taken of the large number of cheap eggs procurable to start several manufactories of dried albumen.

Hides are an important item of the exports.

Manures.—The principal manure used is human excreta; it is carefully saved in large earthenware vessels, prominently disposed along the roadside, and it is carried out to the country by coolies in large open buckets. To meet a line of them on the march on a hot summer's day is a trying experience to new comers in the East. Sewage disposal offers no difficulty in China; there is no false delicacy on the subject. The contents of the buckets are poured into wide pits and mixed with water before applying to the fields. Plant ashes and oil cake are also used, and green manuring to some extent. The want of humus in the soil is considered by experts to be one of the weak points in the local agriculture; at market gardening the Chinese are very painstaking and successful.

It is very probable that on land far away from towns, where the cost of the carriage of human excreta becomes a heavy item, the use of artificial manures would be profitable. It might repay someone to set to work to convince the Chinese farmers of their value and introduce their sale.

Prices.—At the end of 1898 rice, the staple article of food, cost 55 pence for 1 cwt. avoirdupois. A carpenter's or mason's wages in the town is 160 cash (equal to 4 pence) a day. A labourer with a wife and family to support gets on quite well on 8 shillings a month.

Opening for Foreign Capital.—Except at the treaty ports foreigners are not able to acquire land, so the only opportunity for foreign farming is at the treaty ports, where dairy farming to supply the foreign community with milk might pay. The foreign population at Hankow is about 300 and increasing, that of Shanghai is about 4,000.

It is possible that a syndicate might obtain a concession from a Chinese viceroy to dyke and drain a district liable to floods, or some similar scheme, but it would not be easy to get. One of the fatal hindrances to Chinese progress is the want of a proper administration of justice; the magistrates' decisions are determined not by the facts of the case and the law of the land, but by a consideration of which party to the suit has the most powerful influence. It is this that makes the "opening" of China away from the treaty ports impossible at present; if the foreigner can bring no pressure to bear on the authorities the decision is given against him; if he can bring pressure then he wins his case, but incurs the intense animosity of the people. In the treaty ports it is different; the Consuls act as magistrates over their own nationals in cases against foreigners, and their presence facilitates trials of foreigners *versus* Chinese.

H. H. Robinson.

ORCHARDS.

Having been invited to contribute an article to the *Agricultural Students' Gazette*, I have chosen the Cultivation of Orchards as my theme; firstly, because as a West-countryman it is a subject very near my own heart, and secondly, because it is a branch of agriculture, or at any rate of farm work, than which there is none more neglected, none out of which a good return from both capital and industry is so frequently and deliberately thrown away. The fault lies in the fact that neither capital nor industry is, as a rule, expended on farm orchards in this country. As an old writer on the subject has truly said, "Orchards should be cultivated, not merely *allowed to grow.*"

Quite apart from the question of profitable returns, what can be more beautiful in spring, summer, and autumn, than the succession of young leaf, pink blossom, and rosy coloured fruit in an apple-orchard, in close proximity to a picturesque West-country farm house, not to mention the delightful aroma of the apples when gathered, the coolness in summer imparted by the canopy of leafy boughs, and the sense of snugness and homeliness inseparable from such typically English surroundings.

But in these days of fierce competition, a business must be remunerative (and not merely æsthetically pleasing) to satisfy the active and intelligent man who embarks upon it: and this I firmly believe orchard-culture to be, if carried out with the same thoroughness, the same attention to detail, and the same application of scientific knowledge to practical methods as are now typical of other departments of agriculture in the hands of the most enlightened and successful of our English farmers.

The teachings of science, however, are not an indispensable equipment. The application of a little common sense will to a wonderful extent compensate for lack of that knowledge derived from careful observation and experiment, which, under the name of science, so much frightens the farmer.

It almost stands to reason that fruit trees, the vigour of whose stems and branches is being sapped by moss and lichen, of their roots by a superincumbent and exacting crop of luxurious grass, and of their leaves and blossoms (not to mention the forming fruit) by the ravages of countless and voracious insect pests, can hardly prove a source of profit to any farmer: and yet this is the state (without the least exaggeration) of most of the orchards in the once-famous cider producing county of Devon, and, I grieve to say, in all too many in my own county of Gloucester. Herefordshire has of late years, thanks to the progressive and enlightened work of some of her prominent men and of her famous Woolhope Club, made giant strides in the direction of improvement, and Kent and Somerset have for similar reasons commenced the work of reform; but in none of these counties can it yet be said that fruit growers are making the most of the advantages they possess of both climate and soil.

Variable though our English climate is, and uncertain therefore the annual crop of fruit, the latter, if of the right kind, grown on a suitable soil, in a good situation, and well cared for, may be depended on to be at least as "paying" as, and in many districts much more so than, either the cultivation of cereals or the production of beef, mutton, or milk.

I shall speak here only of the apple, because I believe it to be the kind of fruit for which our climate is best suited, for which the popular demand is greatest and most on the increase (to judge by the import statistics), and which by reason of its being less pulpy than most fruits lends itself more both to carriage by rail and also to the processes of storing, and has not therefore to be put on a glutted market suddenly when it reaches its maturity, like strawberries and cherries, and even plums and pears, with little or no profit to the grower.

Let me say at the outset that more than half the apple-orchards in England are "played out": they are full of old trees, which themselves are full of unnecessary timber, produce but little fruit, and that very poor in quality, and are a hot-bed of parasites and micro-organic growth of every possible variety, calculated to infect and overpower any and every younger tree that may be planted in their midst and struggling, but in vain, for a strong, healthy, and unimpeded development. As to such orchards, my advice would be to moot up every tree, plough over the land, and turn the area so cumbered with old wood to any useful farm purpose, other than an orchard, that common sense may suggest.

A small proportion of the older orchards in this country may however be spared, if they receive sufficiently rigorous treatment: in such orchards the very old trees should be cut down and burnt: the burning will not only kill the millions of pests which they contain but will convert such useless "timber" into a valuable cinereal dressing for their middle-aged neighbours still left standing, containing a high percentage of potash, which, as the Duke of Bedford's interesting experiments at Ridgmount have clearly demonstrated, is a chemical constituent particularly in demand for the production both of quality and colour in the matured fruit. The trees of medium age should be well scraped to remove the dead bark and all it contains in its interstices, as well as the lichen, moss, and other parasites with which the living stem is coated, the grass should be carefully removed from above the roots, and the latter generously dressed with suitable manures, and the saw and the knife should be used unsparingly in the removal of all dead and dying wood, all boughs crossing or rubbing against others, and all limbs or twigs which interfere with the free passage of sunshine and of air to every part of the tree. This surgical treatment can hardly be too rigorous if it is to produce good results: my own experience is that more than half the cubic contents of such trees can well be spared and ought to be removed. When the saw is used, it is well to commence sawing beneath the limb about to be removed, so that it will not when falling tear the bark away from the stem below it, and so interfere with the flow of the sap: after sawing, the sawn surface should be trimmed off neatly with a knife, so that there may be no rough edges to collect damp or insect pests. The direction of the cut, whether with saw, knife, or pruning hook, is a matter of some importance in the surgical treatment of all trees, for if the surface of the remaining stump be left uncovered and pointing upwards, it is certain eventually to form a cup in which the rain water collects, rotting the wood beneath it and often penetrating into the heart of the main stem where it seals the fate of the tree. All sawn stumps should be tarred over, and where an upward-pointing surface is inevitable it should, if of considerable diameter, be covered over with a cap of zinc or other metal.

When the old trees have been burnt and the middle-aged treated as above, young trees can then be safely planted in the gaps caused by the removal of the former, care being taken that the spaces are large enough to admit plenty of light and air and that the planting does not take place on the exact spots where the old trees stood. Young trees should never be heavily manured, and in no case should manure be placed under or round their roots while they are being planted: a little surface dressing can do no harm, and on a light or poorish soil will be gratefully received.

Never when planting bury the roots at the bottom of a deep hole: they want the warmth of the sunshine and they want air just as the leaves do, and should be planted so that they can get both: in fact it is hardly possible to plant an apple tree in too shallow a bed as long as the roots after planting are not actually visible on the surface: the young tree should be supported, not by being buried in the earth, but by a good clean wooden stake firmly fixed in the ground prior to planting and tied to the young stem with stout string or cord in such a way that it does not actually touch it at any point, thus avoiding abrasion of the surface and the danger of subsequently transmitting canker or other diseases to which if it rots the stake may become a prey.

The fibrous rootlets should be carefully spread out with the hand at about equal distances from each other and at right angles to the stem of the tree before the soil is spread over and between them, and if there is any development of tap root it should be cut off. The young tree should be protected from the approach of farm stock or rabbits with a clean wooden fence or wire netting (as the case may require) and the surface of the ground above the roots kept clear of grass or weeds for at least two years (and longer if possible) after planting. The branches of the newly planted tree should be cut quite short, and in subsequent years kept regularly and not too mercifully pruned so that it may not produce wood at the expense of the fruit, as is so frequently the case.

Of all systems of planting, the most satisfactory is certainly that of making an entirely new orchard on fresh and (so far as fruit is concerned) unexhausted ground. It certainly has the disadvantage that for a few years after planting the produce (from standard trees at any rate) is far from abundant, but this can be partially remedied by planting between the standards (which should be from 25 to 35 feet apart) pyramid trees on paradise stocks which will bear plentifully in two or three years, and again in the spaces between these small fruit, such as gooseberries, currants, and strawberries. The last-named will of course be removed first as the bush fruit fills their places, and then the pyramids in their turn, until finally nothing but the standards remain: the annual crop of various fruits (and perhaps vegetables too) in the meantime will have been considerable, and will amply repay the initial outlay and current expenses.

Although apples may be grown with success on any average good soil, if suitable varieties be chosen, the best soil for them is undoubtedly a deep and well-drained clayey loam overlying a subsoil of sandstone. Moreover, although many a good orchard is to be found on the flat, a gentle slope with a southerly or south-easterly aspect is to be preferred. Before planting, the ground should be thoroughly well ploughed, or, preferably, dug over, deep rooted weeds collected and burnt, and if the surface soil be light and friable a good dressing of farmyard manure dug in and allowed some months to thoroughly disintegrate prior to the arrival of the trees.

Within the narrow scope of such an article as this I cannot deal fully with the all-important subject of insect and fungoid pests, and the means to be adopted for their prevention or destruction. In the former department Miss Eleanor Ormerod (herself brought up in an orchard district in Gloucestershire) has done a splendid work, and no one can seek better advice than that contained in her books and the leaflets issued by the Board of Agriculture on this subject. Suffice it to say that powdered lime sprinkled after a shower of rain in early spring or late autumn over both stem and lateral branches is one of the most effective of non-poisonous applications for the purpose of destroying the many foes, both animal and vegetable, which get into the crevices of the bark, and a sticky band of cloth or brown paper placed around the stem a few feet from the ground effectively checks the upward climb of the wingless female of the Winter Moth, whose caterpillar commits such cruel ravages on both leaf and blossom, sometimes leaving the trees in early summer as bare as in the depth of winter. The wasteful "windfalls" in early autumn which are erroneously attributed to stress of weather are due to the caterpillar of the Codlin Moth, which lays its eggs in the "eye" of the embryo fruit, whence the caterpillar penetrates to the core where it feeds on the pips. An old manure bag or piece of sacking tied round close to the base of the stem in early summer will act as a trap, and so prevent the caterpillar after boring its way out of the apple from climbing up another tree, where it will make its "nest" in the crevices of the bark.

As regards varieties of apples I will not venture here to say much. There is no doubt that (like farm stock) it does not pay to grow any but the best, and the old idea that it was advisable to plant a cider orchard exclusively with so called cider (or bitter-sweet) apples is now happily exploded. Even in a cider orchard such well known table apples as Blenheim Orange, Cox's Orange Pippin, Ribston Pippin, and King of the Pippins, are not only in place but are a more valuable property to their owner than fruit which threatens to take the roof off one's mouth with its rasping acerbity. I believe thick-skinned apples which will keep (if carefully gathered and stored) until April or May will repay the farmer to grow better than those which are easily bruised and mature early, as very good value can be obtained (and I think will always be obtainable) for English-grown apples after March, which is not the case as a rule before Christmas. I am sure it is good policy and will repay the trouble involved to shake off the apples in the autumn into a net placed beneath the tree to avoid all bruising, which must result in premature decay; and subsequent storage on clean dry shelves in a clean apple-house having an equable temperature, sufficient ventilation, and nothing on roof, walls, or floor to harbour germs or insect life, will enable the grower to sell in the months of April, May, and June an English apple which will compare favourably with any from Tasmania and fetch a better price. The apples when placed on the shelves should not be allowed to touch one another, nor should they be exposed to sudden changes of temperature, which will cause them to "sweat" and so lose their firmness of skin.

It is always advisable for a farmer who values his reputation as a fruit grower to grade his apples as he would his barley; he will thus get for his largest and best alone more than he would for twice the number of the same apples ungraded.

In conclusion, I would only say that I hope our English orchards with the attention which they desire may become as profitable as they are beautiful, and so prove some solace to the farmer who has looked in vain to wheat-growing to obtain a substantial return on his capital and his industry.

CHARLES BATHURST,
M.A., M.R.A.C., F.C.S., &c.

July, 1900.

EXPERIMENTS ON PASTURE, 1900.

Field No. 13.

Experiments were continued on the 20 plots, each $\frac{1}{20}$ acre, used the last eight years or more (see *Agricultural Students' Gazette*, April, 1889, August, 1889 and 1890, December, 1891, August, 1892, 1893, and 1894, July, 1895, and August, 1896, 1897, 1898, and 1899), the manures applied to each plot being the same in kind and in amount as in the previous years.

The manures and their amounts per acre were as follows:—

NO. OF PLOT.		AMOUNT PER ACRE.
A3.	Rape meal	5 cwt.
A2.	Thomas' basic slag	10 ,,
A1.	Farm-yard manure	12 tons.
1.	Sodium nitrate	2½ cwt.
2.	Kainite	5 ,,
3.	Equalised Peruvian guano	5 ,,
4.	Superphosphate	5 ,,
	Ammonium sulphate	2 ,,
5.	Kainite	5 ,,
	Superphosphate	5 ,,
6.	Kainite	5 ,,
	Superphosphate	5 ,,
	Sodium nitrate	2½ ,,
7.	Unmanured	
8.	Kainite	5 ,,
	Superphosphate	5 ,,
	Ammonium sulphate	2 ,,
9.	Ammonium sulphate	2 ,,
10.	Kainite	5 ,,
	Sodium nitrate	2½ ,,
11.	Kainite	5 ,,
	Ammonium sulphate	2 ,,
12.	Equalised Peruvian guano	5 ,,
13.	Superphosphate	5 ,,

NO. OF PLOT.		AMOUNT PER ACRE.
14.	Superphosphate Sodium nitrate	5 cwt. $2\frac{1}{2}$ „
B1.	Farm-yard manure	12 tons.
B2.	Thomas' basic slag	10 cwt.
B3.	Rape meal	5 „

This is the thirteenth year in succession for the application of the same manure to plots 1—14, the twelfth year of the farm-yard manure plots, and the ninth year of the application of Thomas' basic slag and rape meal.

The farm-yard manure was applied in December, 1899 ; the kainite, basic slag, and rape meal were applied on December 7th, 1899 ; the superphosphate and the guano on March 5th ; the ammonium sulphate on April 17th ; and the sodium nitrate on May 8th, 1900.

The guano, equalised Peruvian, contained combined nitrogen equivalent to ammonia, 7·81 per cent., phosphates 31·3 per cent., and potash 2·0 per cent.

The superphosphate contained 26·5 per cent. of "soluble" phosphate, and 1·9 per cent. of insoluble phosphate.

The kainite contained 13·2 per cent. of potash (K_2O).

The sodium nitrate contained 95·0 per cent. of pure nitrate, equivalent to 19·0 per cent. of ammonia, and the ammonium sulphate contained 24·6 per cent. of ammonia.

The basic slag contained phosphates equivalent to 41 per cent. of tricalcic phosphate.

The grass was cut on June 22nd and weighed on the 29th ; rain fell on the 22nd, ·06 inch, the 24th and 25th, ·59 inch, but the hay was very well got.

The yield of the plots, calculated to amounts per acre, was as follows :

		Per acre. cwts.	Excess over Unmanured plot. cwts.
A3.	Rape meal	$19\frac{1}{8}$	—
A2.	Thomas' basic slag	$22\frac{1}{8}$	$2\frac{1}{8}$
A1.	Farmyard manure	$30\frac{3}{8}$	$10\frac{3}{8}$
1.	Sodium nitrate	22	2
2.	Kainite	$14\frac{1}{2}$	—
3.	Guano	$19\frac{5}{8}$	—
4.	Superphosphate and ammonium sulphate	$23\frac{7}{8}$	$3\frac{7}{8}$
5.	Kainite and superphosphate	$23\frac{1}{4}$	$3\frac{1}{4}$
6.	Kainite, superphosphate, and sodium nitrate	$28\frac{1}{4}$	$8\frac{1}{4}$
7.	Unmanured	20	—

		Per acre. cwts.	Excess over Unmanured plot. cwts.
8.	Kainite, superphosphate, and ammonium sulphate	28⅝	8⅝
9.	Ammonium sulphate	27⅞	7⅞
10.	Kainite and sodium nitrate	25	5
11.	Kainite and ammonium sulphate ...	28½	8½
12.	Guano	22⅝	2⅝
13.	Superphosphate	22⅛	2⅛
14.	Superphosphate and sodium nitrate ...	34⅛	14⅛
B1.	Farm-yard manure	34¼	14¼
B2.	Thomas' basic slag	22⅛	2⅛
B3.	Rape meal	25	5

Some of the meteorological observations during the first six months of the year were as follows:—

1900.	Rain. Inches.	Rainy days.	Average Rainfall 30 years. 1870-1899.	Mean temp. F°.	Days of frost on grass.
January ...	3·02	19	2·62	39°1	21
February ...	5·81	20	2·16	35°8	22
March ...	0·95	7	1·89	37°8	21
April ...	0·81	14	1·86	44°3	10
May ...	1·80	11	2·04	49°9	6
June to 28th	2·26	16	2·24	57°5	0

The plot which received kainite only showed less growth than the unmanured plot, but *Lotus corniculatus* was very prevalent on it. Nitrate of soda alone gave very little increase in crop, though sulphate of ammonia alone gave an increase of nearly 8 cwt. of hay. The increase on the plots to which basic slag, rape meal, or superphosphate alone was applied was but small. The phosphatic manures encouraged the growth of clovers. Superphosphate and kainite together gave an increase of 3 cwt. of hay and this contained a very large amount of *Trifolium minus*; guano gave very little increase, but the quality was undoubtedly improved. Kainite and nitrate of soda did much better than either separately. The farm-yard manure plot towards the east of the field gave the highest yield, followed very closely by the plot receiving superphosphate and nitrate of soda, with increases over the unmanured plot of more than 14 cwt. of hay. It must be remembered that the staple of the field is better towards the east.

The plots receiving the most mixed manures, kainite, superphosphate and ammonium sulphate; and kainite, superphosphate and sodium nitrate, also kainite and ammonium sulphate, came next with increases of over 8 cwt. of hay. Excepting the plot receiving superphosphate and ammonium sulphate, the plots receiving ammonium sulphate alone or with other manures gave this year a better return than the corresponding plots with nitrate of soda.

The average yield per acre of all the plots was $24\frac{5}{8}$ hundredweight of hay. There was only a small amount of the smut *Ustilago hypodytes* (Sch.) on *Bromus erectus*, but it was less prevalent in the field than in many years. After hay harvest the whole field was grazed with cows and sheep. E. K.

AGRICULTURAL EDUCATION.

The Agricultural Education Committee, whose formation and programme we noticed in our issue of December last, has done good work during the year of its existence; it held its second general meeting on June 22nd, under the chairmanship of the Earl Egerton of Tatton. The general policy of the Committee has been to educate and stimulate public opinion and Parliament in favour of certain educational reforms in the Rural Districts, and to bring pressure to bear on the Board of Education with regard to these.

The most laborious work of the Executive has been the issue of its publications, including twenty-three pamphlets by members of the Committee. Some of these pamphlets give a succinct review of the existing state of Agricultural Education in the United Kingdom, the Colonies, and some foreign countries; the majority of these have been written by Mr. J. C. Medd, of Stratton, Cirencester. The other pamphlets have been propagandist in character, being intended to imbue agriculturists, school teachers, and the public generally with ideas on the importance of suitable rural education, and the best means of giving it; one of these was written by a member of our College staff. These pamphlets have had a wide circulation, and some of them have been supplied, at request, to various of the Government Departments.

A great many articles, specially written by members of the Committee, on the subject of Rural Education, have appeared in the London and Provincial newspapers. The Executive have in preparation a Reader on agricultural subjects for the use of elementary schools, and also are preparing a series of "nature study" leaflets after the style of those published by the Cornell University.

This and other work it has done with a small income of under two hundred pounds; it has been decided to carry on the work of the Committee for another year, and it is hoped that more funds will be placed at its disposal.

The principal speakers at the general meeting were the Chairman, Lord Egerton, Sir William Hart Dyke, Mr. J. H. Johnstone, M.P., and Professor Story Maskelyne. Lord Egerton expressed his approval of the work done by the Committee in the way of encouraging the kind of work being done in his own county of Cheshire specially through a school of dairying and experimental farm and garden, also in stimulating public opinion and giving support to the Government in carrying out in the best way possible the principles they advocated. Sir William Hart Dyke was glad to say that the Board of Education had not taken up the policy of the Committee in any niggardly spirit, but what it had done would carry out a complete revolution in agricultural education. The new Education Bill would not have a good chance of becoming law this Session, but the Committee could do useful work in supplying information with regard to suggested local authorities, and in supporting the Board of Education. Professor Story Maskelyne spoke on the importance of training country children to take more interest in the world around them, so that they might care to stay in the country after their school days, and not give way so completely to the attractions of the towns. But the old system of teaching must be completely changed, and teachers should be appointed who were in sympathy with that it was sought to teach. They must not cram up simply from text books but go to nature for their knowledge.

VISITS TO THE BATH AND WESTERN COUNTIES AGRICULTURAL SHOW AND TO BUSCOT PARK.

The "Bath and West" was held this year at Bath, and on June 1st an opportunity was afforded for many of the students of the R.A.C. to visit this annual exhibition under easy and favourable circumstances. The show ground itself was pleasantly situated and commanded a fine view of the old city and its picturesque surroundings. The weather was all that could be desired, being sufficiently cool to enable visitors for the day to get round the larger part of the extensive grounds in that time. Although there was much to interest one in seeing the various exhibits, which included a very creditable collection of flowers, as well as an art gallery, the Show, from an Agricultural point of view, was not so good as usual. Sheep and Dairy Cattle classes were not so well represented as might be expected in such a good centre. Notwithstanding this, the *Free day* given by the College for the purpose of visiting this popular Agricultural exhibition was highly appreciated. It is satisfactory to know that the highest honours were gained for Cotswold sheep and Berkshire pigs by representatives from the long celebrated flock and herd belonging to the Royal Agricultural College farm.

On Tuesday, July 3rd, an excursion was made to Buscot Park, in order to inspect the stock and dairy belonging to A. Henderson, Esq., M.P. The party of twelve was accompanied by Professors Blundell and Woodruff, the pleasant drive of eighteen miles to and fro, by way of Fairford and Lechlade, being an enjoyable part of the outing. They were met at the Stud Farm by Mr. W. Crosland, the agent of the property, and at once proceeded to examine some of the Shire Stallions, which have such a world-wide reputation among breeders of this class of horses. Among the most noticeable were "Markeaton Royal Harold," which was the Champion Horse at the London Show in 1897, and his son "Buscot Harold," who also took the same honours the three following years in succession. Two and three-year-old entires were also taken round the track, which from their grand muscle, feet, action, and general form, give promise of being, one day, as famous as their older rivals. A large number of mares, many of which had gained honours in the prize ring, were seen in the pastures, with foals at foot, by the two grand Champions already named; and, although so young, exhibit the characteristics of their famous sires. The Stud at present consists of more than fifty animals, notwithstanding that a large sale was held early in the year. Several first-class mares from some of the best Shire Studs in the country were also seen, which had come to be mated to "Markeaton Royal Harold" and "Buscot Harold." After a thorough examination of this important branch of the Buscot farm stock, an adjournment was made for lunch, which had been hospitably provided by Mrs. Crosland, who was kind enough to favour the party with her company at the table. In the afternoon carriages were provided by Mr. Crosland, and an inspection was made of the herd of pedigree Shorthorns, which of itself is well worth a visit from any-one interested in raising first-class dairy cattle. It includes many prize-winning cows, such as "Grace Darling" and "Dowager 13th," and represents the noted families of "Oxfords," "Pansys," and "Cruickshank Clippers," &c., all of which have been selected with the view of combining quantity of milk with a plenty of flesh. The Bull now in use is "Wanderers' Prince," bred by and purchased from Mr. Marr, who is, perhaps, one of the most noted breeders of Shorthorns in Scotland. This Bull looks, all over, like one that will impress his good qualities upon the herd. Many of the Cows are of great size, with capacious udders, and their milking records, which are unusually high for pedigree stock, testify to their being able to do their share in supplying the dairy, as well as in furnishing the butcher, when their milking days are over, with a fine carcase of beef. A large number of fine heifers of various ages were shewn, all of which, in due course, will come into the herd. The Calves are weaned on separated milk, linseed and other meals, and testify to the careful attention and good management of the stockmen. The Dairy Factory on the estate is equipped with the most modern appliances, and is lighted by electricity. The plant consists of the latest and best separators, Pasteurizer, and refrigerators, scalders, &c., all of which are worked by steam power. This dairy is supplied by the produce from the herd of about one hundred pedigree and non-pedigree cows, as well as the milk bought from the tenants on the estate, amounting in all to some 1,200 gallons per day. Large quantities of cream are sent to London, and separated milk is consigned to the great Biscuit factories at Reading and elsewhere. The Sheep are well represented by a flock of registered Hampshire Down Ewes, lambs from which took the highest honours last year at the Royal Counties' Show. A draft of these ram lambs will be sold at the Cirencester Great Ram Sale, on Tuesday, August 7th, and others at the Oxford Ram Sale in August. Those which were inspected were of remarkably even quality and well fleshed. Another important item of stock is the herd of pedigree Berkshire Pigs, and which, considering the amount of capital employed and the quick turn over, is probably the most remunerative. These are accommodated in premises capitally arranged and admirably adapted for raising large quantities of pigs on the most economical and healthy conditions. A fine sow from this herd, "Buscot Stumpy," was First this year in her class at the "Bath and West"; First and Champion at the Oxford Show; First at the Wiltshire, and the "Royal Counties" Show; the very type of animal from which pigs should be raised to meet the demand for our great Bacon Factories. At the present time one of the best Boars is hired for service from the herd of Russell Swanwick, Esq., R. A. College farm. Anyone breeding pigs would do well to purchase sires or hilts from such a vigorous and healthy stock as that found at Buscot Park. The long afternoon was well spent in seeing all these interesting departments of the estate, of which upwards of 2,000 acres are in hand. Of this, 600 acres are arable land, and the rest good pasture, admirably adapted for stock raising. Time was found for visiting the estate nurseries, where young trees and shrubs of all kinds are raised for re-planting woods and plantations. Under the guidance of the head gardener a visit was also made to the beautifully kept gardens and greenhouses surrounding the Mansion. An idea of the size and extent of these may be gained from the fact that eighteen men are regularly employed, and to judge from the way in which every detail is managed, they must be all fully occupied. The whole estate shows evidence of careful and profitable management, and there must also be considerable judgment exercised in the breeding of such a large quantity of high class stock. Mr. Crosland is evidently thoroughly in touch with every department, and is not only a lover of country pursuits himself, but has also the happy knack of instilling the same enthusiasm into those who are working under him in their various positions. The day spent so pleasantly in his company at Buscot will long be remembered by the students of the Royal Agricultural College, and cannot fail to be of advantage to them from an educational point of view.

E. B.

DIPLOMA.

At the end of last (Spring) term the following gentlemen took the Diploma of Membership, with Honours: Mr. Alan Hutchings and Mr. R. C. Macdougall. Mr. Hutchings also obtained the Ducie Gold Medal. Certificates of Proficiency in Practical Agriculture were obtained by Mr. S. W. Warner and Mr. T. G. Gandy. The External Examiner in Agriculture was Mr. G. Fiske, of Bramford, Suffolk; in Agricultural Chemistry, Dr. J. A. Voelcker; in Veterinary, Sir G. T. Brown; and in Practical Engineering, Professor Robinson.

AT THE FRONT.

The following past students should be added to the list of twenty-four given in our last issue.

G. Waters Beck, 43rd Company, Suffolk, Imperial Yeomanry.

A. E. Bonsey, Lieutenant, Border Horse (wounded).

R. Dunn-Gardner, Lieutenant, 4th South Staffordshire Regiment.

E. Howard-Vyse, M.R.A.C. (December, 1898), 2nd Lieutenant, G Company, 3rd Durham Light Infantry Regiment.

Leonard E. A. Jaques, Corporal, 13th Regiment, Duke of Cambridge's Own, Imperial Yeomanry.

C. Giffard Jeffery, R.A.C. (1898), Lance-Corporal, Volunteer Company, Princess of Wales's Own, Yorkshire, Regiment.

Gilbert J. Parry, M.R.A.C. (1896), 21st Company, 2nd Battalion, Imperial Yeomanry.

G. R. Smith (Assoc. R.A.C., 1897), No. 8510, 19th Company, 6th Regiment, Imperial Yeomanry.

W. Clowes Sowels, M.R.A.C. (1891), 43rd Company, Norfolk, Imperial Yeomanry.

Bernard W. Warren (R.A.C. 1886-1887), of New Hanover, Natal. Killed at the Battle of Colenso, December 15th, 1899.

B. E. Wilson, M.R.A.C. (1889), Sergeant, 66th Company, Yorkshire, Imperial Yeomanry.

THE SURVEYORS' INSTITUTION.

At the last Spring examination of the Surveyors' Institution Mr. F. A. S. Goodbody and Mr. T. B. Wacher passed for the Professional Associateship.

OLD STUDENTS.

Mr. Edric Druce, M.R.A.C. (1891), has been appointed Principal to Agricultural and Horticultural School, Holmes Chapel, Cheshire.

Mr. A. Guillum Scott (1870-1871), has been appointed Accountant General, India Office. He is also Trustee of the Dogs' Home, Battersea.

Mr. James Muir, M.R.A.C. (1888), late Professor of Agriculture, R.A.C., and at the Yorkshire College, Leeds, has been appointed Secretary to Associated Board of Royal Academy of Music and Royal College of Music.

CHLORINE IN RAIN WATER.

The rainfall for the six months ending March 31, 1900, was 18·32 inches, falling on 78 days; it contained chlorides equivalent to ·385 grains of sodium chloride per gallon; the deposit per acre was thus equal to 22·67 lbs. For the twelve months ending at the same date the rainfall was 29·84 inches and the chlorine equal to 32·39 lbs. of common salt per acre.—E. K.

COLLEGE NOTES.

At a sale of blood stock at Newmarket, on July 5th, Mr. Russell Swanwick obtained 1,200 guineas for Marengo, a chestnut colt by Grey Leg—Common Law; Mr. W. Low was the purchaser. Other yearlings from the same stud were sold, viz., Chancellor Raeburn, a chestnut colt by Raeburn—Lady Cecil, for 760 guineas to Mr. J. Dawson, jun.; and Corunna, a grey filly by Grey Leg—Pampeluna, for 300 guineas to Mr. R. Chaloner. A Ladas filly put up at the same time did not fetch her reserve.

Complete series of the *Students' Gazette*, New Series, Vols. I.-IX., 1882-1900, have been sent to the Board of Agriculture of England, the Department of Agriculture and Technical Instruction for Ireland, the Surveyors' Institution, Great George Street, Westminster, and the Farmers' Club, Salisbury Hotel, London.

LAWN TENNIS.

Although at the beginning of the season the prospect of raising a team capable of maintaining the high reputation of the College at this particular sport was somewhat gloomy, nevertheless, to the credit of our captain it must be mentioned, that on no occasion have we failed to carry out the fixtures on our card, and that if successful in but a few of our matches, the margin of defeat has on several occasions been a narrow one. The marked improvement of the second pair has been obvious to the most casual observer, but the constant and unavoidable changes in the first and third pairs have prevented that combination so important in the successful rendering of the double game. The energy displayed by the various members of the club in rolling and otherwise looking after the ground has resulted in our courts maintaining their usual high standard.

R.A.C. v. University College, Oxford, June 2nd.—Played at Oxford, resulting in the decisive defeat of the R.A. College.

R.A.C. v. East Gloucestershire, June 6th.—Played at Cheltenham. Owing to the untiring energy of our Editor, the first pair won 2 matches, but the final result was 2—7. The College team was made up of:—

Fosbery Stenhouse	1	Blois Gunter	2	Gawthropp Harben	3

R.A.C. v. Swindon, June 23rd.—Played at Swindon. Thanks are due to the excellent manner in which we were received and entertained by members of the Swindon team. A good game ended in our defeat by the odd match. For Swindon, Wood and his partner won all 6 matches, and Stoke and Reed showed excellent combination.

R.A.C. v. Mr. Ross-Hume's VI., June 7th.—Played on the College ground. The College six, though fighting hard, were rather out-classed.

R.A.C. v. East Gloucestershire, June 30th.—Played on the College ground. This match was rather spoilt by rain, but the College eventually won by 5—4. For the visitors Messrs. Raynor and Foster played best, and for the College Messrs. Gawthropp and Locke.

R.A.C. v. Mr. R. Ellett's VI., July 7th.—Played at the College. In spite of the good play of Messrs. Ellett and Sewell, the result was in our favour by 6—3.

R.A.C. v. Mr. Ross-Hume's VI., July 12th.—Played at the College. The visitors won by 5—3, one match being drawn.

R.A.C. v. Swindon, July 14th.—Played at the College. In this return match we succeeded in reversing our previous defeat. Our team consisted of

Locke	West	W. Wilson
Gawthropp	Ashton Smith	H. B. White

Past v. Present.—Played on July 20th. Mr. Swanwick, as on many previous occasions, kindly provided entertainment for the teams and their friends.

B. S. Cave and W. Brocklehurst v. W. Fosbery and W. Wilson.—This match was played at Mr. Swanwick's, and won by the Past. 6—2 ; 6—4.

B. S. Cave and W. Brocklehurst v. A. Gawthropp and G. T. Locke.—Won by the Past. 6—0 ; 6—3.

B. S. Cave and W. Brocklehurst v. H. Atkinson and C. H. Whyte.—Won by the Past. 6—1 ; 6—0.

C. Cook and R. C. MacDougall v. W. Fosbery and W. Wilson.—Won by the Past. 6—3 ; 6—3. Cook was in great form, getting in some very hard services.

C. Cook and R. C. MacDougall v. A. Gawthropp and G. T. Locke.—Won by the Past. 6—1 ; 6—4.

C. Cook and R. C. MacDougall v. H. Atkinson and C. H. Whyte.—Won by the Past. 8—6 ; 6—1. The Present at first played very well, some good games resulting in 6-all.

W. D. Lidderdale and J. A. Ross-Hume v. W. Fosbery and W. Wilson.—Won by the Present. 4—6 ; 6—3 ; 2—6.

W. D. Lidderdale and J. A. Ross-Hume v. A. Gawthroppe and G. T. Locke.—The first set was won by the Present, who eventually won the match after severe contests in both the second and third sets. Score :—2—6 ; 8—6 ; 6—8.

W. D. Lidderdale and J. A. Ross-Hume v. H. Atkinson and C. H. Whyte.—Won by the Past. 6—3 ; 6—2.

This term a handsome Challenge Cup for the Lawn Tennis Singles has been instituted by the Students' Club. The competition for it was very eager, there being no less than twenty-two entries. Mr. H. Harcourt very kindly presented the second prize. This Challenge Cup and the first prize was won by W. Fosbery, A. Gawthropp winning the second prize.

The entries for the Scratch Doubles reached the respectable number of seventeen pairs, and in the semi-final were left in Fosbery and F. N. Smith *versus* Professor West and Ashton Smith; the former pair eventually won.

CRICKET.

CHARACTERS OF THE XI.

G. GUNTER (Captain).—A free bat with a good forward drive. Has more than once pulled the side out of difficulty this season. Useful change bowler, keen field and captain.

V. STENHOUSE.—A good bat when set, has had very bad luck this season, is a splendid field, and bowls good lobs.

W. FOSBERY.—A good all round man, is a good bat, and has played very useful cricket for his side, brilliant field, especially in the long field, also useful change bowler.

F. GOODBODY.—A good bat and hits hard, gets runs very fast, good field, and bowls well, but inclined to be erratic at times.

H. ATKINSON.—Very good bat, hits hard and clean, gets runs fast, and has been very useful to the team, is a good out field and third man. Unfortunately he has not been seen at his best owing to ill health.

B. S. CAVE.—Most reliable and safe bat, and has helped his side greatly, especially against Cheltenham College. Is a very good field and bowler. Unfortunately, through an accident, has not been able to bowl the latter end of the season.

E. WALFORD.—A most brilliant wicket keep, quite one of the best the College has ever seen, has been a great help to his side. Is a good bat, and scores fast when set.

G. HARBEN.—A good medium-pace bowler, has much improved towards the end of the season. Is a very good field and an uncertain bat, but hits hard and scores freely when set.

L. J. DARLING.—A very good left-hand bowler, inclined to bowl too fast, has bowled with great success of late. Is a good field, an uncertain bat but scores fast, and has proved very useful to his side.

D. HERVEY.—A good field, but relies too much on fielding with one hand; has improved very much at the end of the season. Bats with great freedom when set, but is inclined to be impatient. Did very good service against Cheltenham Town

J. C. BELL.—Is a good slow bowler, keeps a good length, is a good field, and hits hard.

As extra man, S. BURRELL is a useful change bowler, a good field, and makes runs occasionally; wants more practice in batting, likely to improve much for next season.

R.A.C. v. STROUD.—This match, being the first to open the season, was played at Stroud on May 26th on a very slow wicket, and resulted in a win by 31 runs for the College, Atkinson, Goodbody, and Fosbery being the chief contributors to the score. Cave was very successful with the ball, taking 8 wickets for 61 runs. Score :—

R.A.C.		Stroud.	
V. Stenhouse, c Step'ns, b Huggins	0	Huggins, b Cave	29
W. Fosbery, b Huggins	24	—. Godsell, c and b Cave	17
H. Atkinson, b Huggins	64	W. A. Smith, b Cave	0
B. S. Cave, c Allen, b Bruton	0	C. P. Allen, b Cave	0
F. Goodbody, b Poole	33	F. Warman, l-b-w, b Stenhouse	11
G. Gunter, b Huggins	16	O. Chambers, b Cave	7
D. G. Hervey, b Huggins	0	C. Merrett, b Stenhouse	0
H. B. Beddall, b Huggins	0	G. Bruton, l-b-w, b Cave	23
S. Burrell, b Poole	1	J. Stephens, c Hervey, b Cave	11
P. J. Lindsell, b Huggins	0	H. Poole, b Cave	9
E. Walford, not out	2	A. Green, not out	1
Extras	3	Extras	4
Total	143	Total	112

R.A.C. v. Cheltenham Town.—Played at Cheltenham on May 30th, on a very fast and bumpy wicket. The College winning the toss batted first, the first five wickets falling very soon. Gunter and Hervey contributed a useful 78 before they were parted, the innings closing for a total of 120. For Cheltenham town the chief contributors were Hodgkins 74 and Wrathall 38. The result was a loss for the College of a good game by 48 runs. For the College, Cave took 4 wickets for 50, Goodbody 4 for 49. Score :—

R.A.C.		Cheltenham Town.	
V. Stenhouse, b Mills	0	P. Hodgkins, c Darling, b Cave	74
W. Fosbery, b Wrathall	3	Wrathall, c Goodbody, b Darling	38
H. Atkinson, b Mills	3	O. Jessop, c Goodbody, b Darling	5
B. S. Cave b Wrathall	0	C. H. Margretts, c Walford, b Goodbody	5
F. Goodbody, b Wrathall	7	N. B. Foster, b Goodbody	10
G. Gunter, b Jessop	36	C. Kettle, b Goodbody	17
G. B. Harben, c Dighton, b Wrathall	3	W. Lamb, b Cave	1
L. J. Darling, c Straw, b Mills	0	G. Straw, b Goodbody	5
D. G. Hervey, b Jessop	42	Dr. Dighton, c Atkinson, b Cave	1
E. Walford, not out	7	Mills, b Cave	0
S. Burrell c and b Jessop	0	Read, not out	3
Extras	18	Extras	9
Total	120	Total	168

R.A.C. v. Lechlade.—Played at Lechlade on June 2nd on a very slow and wet wicket. The College, winning the toss, batted first, Cave, Walford, and Hervey being the chief contributors. The game resulted in the College losing by 25 runs. For the College, Gunter took 4 wickets for 39 runs, and Goodbody 1 for 29. Score :—

R.A.C.		Lechlade.	
D. G. Hervey, b Turner	24	Rev. H. Ellison, c and b Gunter	56
F. Goodbody, c Stone, b Ellison	19	G. W. Cancellor, b Goodbody	3
B. S. Cave, st Wright, b Milward	34	S. W. Spooner, b Gunter	64
L. J. Darling, c Wright, b Turner	4	C. C. Stone, b Gunter	2
G. Gunter, c Pott, b Ellison	0	Turner, run out	6
E. Walford, c Hobbs, b Milward	33	J. A. Pott, c and b Gunter	0
A. W. Wilson, c Stone, b Ellison	1	H. Milward, b Cave	8
S. Burrell, not out	7	L. Hobbs, not out	1

F. H. Smith, b Milward	0	Rev. W. H. T. Wright, not out	15
P. J. Lindsell, run out	1	W. Hobbs,	Did not bat
H. B. Beddall, b Milward	4	B. F. Innocent,	
Extras	11	Extras	9
Total	137	Total (7 wickets)	162

R.A.C. v. CIRENCESTER TOWN.—This match was played on the Town ground on June 9th, and resulted in a bad loss to the College by 172 runs. For the College, Stenhouse played very well for his 33. For the Town, Allen, Legg, and Tovey were the chief contributors. Score:—

CIRENCESTER.		R.A.C.	
S. Boulton, c Goodbody, b Gunter	8	V. Stenhouse, b Prout	33
W. G. Tovey, b Goodbody	43	W. Fosbery, b Giles	14
R. W. Ellett, c and b Gunter	6	B. S. Cave, b Prout	14
C. Allen, b Goodbody	89	F. Goodbody, b Legg	13
W. G. Legg, not out	47	D. G. Hervey, c Wright, b Legg	1
A. Prout, c Cave, b Gunter	14	G. Gunter, c Prout, b Tovey	1
E. C. T. Dodd, c Burrell, b Goodbody	21	E. Walford, b Tovey	5
W. May, c Fosbery, b Stenhouse	14	G. Harben, c Allen, b Legg	0
Giles, not out	2	L. J. Darling, not out	2
W. H. J. Wright*		S. Burrell, b Tovey	3
H. St. G. Rawlins*		P. Lindsell, b Tovey	0
Extras	12	Extras	9
Total (7 wickets)	256	Total	94

* Did not bat. Innings declared closed.

R.A.C. v. SWINDON.—Played at Swindon on June 13th. The College losing the toss, Swindon batted first, much to their advantage, as the ground was very wet, and play had to be stopped several times owing to rain, the result being a draw. Swindon made 180 for 2 wickets, of which Reynolds contributed 100. The College started badly, and only responded with 71 for 8 wickets. Score:—

SWINDON.		R.A.C.	
R. Reynolds, not out	100	W. Fosbery, b Warner	0
D. C. Morrison, b Gunter	21	V. Stenhouse, run out	3
H. Rivers, run out	22	F. Goodbody, c Collins, b Warner	26
S. Warner, not out	19	G. Gunter, c McIlroy, b Williams	29
C. Williams	Did not bat. Innings declared closed.	D. Hervey, c Collins, b Warner	2
T. Cox		E. Walford, b Warner	2
McIlroy		G. Harben, c Reynolds, b Warner	0
S. B. Morrison		L. Darling, c and b Williams	0
A. E. Deacon		S. Burrell, not out	7
W. E. Collins		W. Wilson, not out	1
E. W. Goodman		G. J. Wilson, to bat	
Extras	18	Extras	1
Total (2 wickets)	180	Total (8 wickets)	71

R.A.C. v. GLOUCESTER CITY.—Played at Gloucester on June 16th. The College, winning the toss, batted first and fared badly, only making the poor score of 57 runs. Hacker and Roberts took all the wickets against the College. Gloucester, having an exceptionally strong team, made 254 for 5 wickets. Score:—

R.A.C.		GLOUCESTER.	
W. Fosbery, b Roberts	7	H. W. Arkell, b Glossop	21

V. Stenhouse, st Romans, b Roberts	1
F. Goodbody, c and b Roberts	10
G. Gunter, b Hacker	2
E. Walford, c Arkell, b Roberts	12
D. G. Hervey, b Hacker	0
G. Harben, b Hacker	0
C. J. Tunstall, c and b Roberts	0
L. J. Darling, b Hacker	14
G. J. Wilson, b Hacker	5
—. Glossop, not out	0
Extras	6
Total	57

P. H. Ford, c Fosbery, b Goodbody	20
A. S. Winterbotham, c Hervey, b Wilson	70
H. J. Boughton, b Glossop	27
J. R. Jackson, not out	73
G. F. Collett, c Walford, b Wilson	6
G. Romans, not out	33
F. Tandy W. D. Palmer Hacker W. Roberts	Did not bat.
Extras	4
Total (5 wickets)	254

The match arranged v. Brasenose College, Oxford, on June 20th, at home, was scratched, the latter being unable to raise a team, owing to the Schools being on.

R.A.C. v. CHELTENHAM COLLEGE.—Played at Cheltenham College on June 23rd, on a very fast and true wicket, the match resulting in a draw. Cheltenham College, winning the toss, batted first, and made 272 for 4 wickets, and declared their innings. The College then put together 144 for the loss of 8 wickets, Fosbery making 33, Goodbody 38, and Cave, playing an excellent game for 13, had to retire hurt in the earlier part of his innings. Score :—

CHELTENHAM COLLEGE.	
C.T.C. Plowden, st Walf'd, b Cave	77
R. S. Bridge, b Harben	100
G. Marsden, not out	15
A. K. White, c Fosbery, b Cave	6
K. R. B. Fry, not out	55
C. E. Stranach, c Walford, b Cave	12
R. W. Sharp T. H. Ker A. N. J. Harrison W. J. Clayton J. P. Winterbotham	Did not bat. Innings declared.
Extras	7
Total (4 wickets)	272

R.A.C.	
W. Fosbery, c Sharp, b White	33
V. Stenhouse, c Stran'h, b Marsden	18
B. S. Cave, not out	13
H. Goodbody, b Stranach	38
G. Gunter, st Fry, b Winterbot'm	10
E. Walford, c Fry, b Stranach	6
D. G. Hervey, c Fry, b Stranach	15
C. J. Tunstall, run out	0
G. P. Harben, c Fry, b Stranach	3
L. J. Darling, not out	1
P. J. Lindsell, did not bat	
Extras	7
Total (8 wickets)	144

R.A.C. v. TETBURY.—This match was played on the College ground on June 27th, and resulted in a win for the visitors. Stenhouse contributed a useful 55 for the College. For the College, Cave took 4 wickets for 78, Goodbody 3 for 54, Darling 1 for 10, and Harben 1 for 0. Score :—

TETBURY.	
H. Tovey, c Tunstall, b Cave	9
C. P. Oldrey, l-b-w, b Cave	7
F. J. Bates, b Goodbody	22
W. Cook, st Walford, b Cave	4
J. Warn, run out	0
A. Prout, b Goodbody	1
J. Fowler, b Goodbody	0
Newman, c Hervey, b Cave	23
G. Soper, b Darling	30

R.A.C.	
V. D. Stenhouse, l-b-w, b Prout	55
W. Fosbery, b Newman	1
B. S. Cave, b Bates	5
F. Goodbody, b Bates	2
G. Gunter, run out	2
E. Walford, b Bates	15
D. G. Hervey, c Prout, b Newman	2
G. Harben, b Newman	10
L. J. Darling, c Soper, b Bates	1

F. C. Cornell, b Harben	10	G. J. Tunstall, not out	0
F. Smith, not out	0	G. J. Wilson, b Prout	0
Extras	2	Extras	2
Total	108	Total	95

R.A.C. v. Lechlade.—This match was played at Lechlade, on Saturday, June 30th, and resulted in a loss for the College by 80 runs. The College was very poorly represented, as the match was played at Lechlade, owing to Mr. B. S. Cave's not being able to get a team, three of the regular XI. being absent. Score :—

R.A.C.		Lechlade.	
F. Goodbody, st Bowley, b Turner	16	C. C. Stone, c and b Cave	34
B. S. Cave, c March, b Milward	8	E. Bowley, c Walford, b Glossop	15
G. Gunter, c Tovey, b Turner	0	G. W. Cancellor, run out	2
E. Walford, c Stone, b Milward	3	R. W. Lyne, c Gunter, b Darling	17
C. J. Tunstall, b Milward	6	H. Milward, c Cave, b Goodbody	2
D. G. Hervey, b Milward	1	L. Hobbs, c Darling, b Goodbody	8
L. J. Darling, b Milward	9	B. Innocent, c Hervey, b Bell	23
H. Beddall, b Turner	6	Turner, not out	33
G. Dodd, c March, b Milward	1	Dr. March, b Bell	0
J. C. Bell, b Milward	3	E. Tovey, b Bell	0
—. Glossop, not out	0	G. Davis, run out	0
Extras	11	Extras	10
Total	64	Total	144

R.A.C. v. East Gloucestershire.—Played at Charlton Park on July 4th. The College, winning the toss, went in first, and scored 198. The first 3 wickets fell very quickly, but Goodbody and Walford stopped the rot, the former scoring 47 and the latter 43. The match ended in a draw in favour of the College. Score :—

R.A.C.		East Gloucestershire.	
V. D. Stenhouse, b Westcott	0	H. Ross, c Walford, b Smith	12
W. Fosbery, c Champ'n, b Westc't	21	J. N. Champain, c Fosb'y, b Smith	28
H. Atkinson, c Champ'n, b Westc't	2	B. Auden, b Darling	24
F. Goodbody, b Auden	47	H. Jessop, b Smith	11
G. Gunter, c Williams, b Westcott	6	H. Phillips, c and b Darling	0
E. Walford, c Norman, b Westcott	43	F. M. Norman, not out	17
F. H. Smith, c Jessop, b Westcott	3	Westcott, b Darling	16
G. Harben, c Champ'n, b Westcott	18	J. O. T. Powell, b Darling	6
L. J. Darling, b Westcott	8	O. Williams, st Walford, b Smith	12
J. C. Bell, not out	19	H. Stroud } Did not bat	
P. J. Lindsell, st Champ'n, b Jessop	12	Gould }	
Extras	19	Extras	7
Total	198	Total (8 wickets)	137

R.A.C. v. Swindon.—Played at the College on July 7th. The College, winning the toss, went in and put together 161 runs, of which Atkinson contributed 54 and Darling 40, the latter making his runs in fine style in eighteen minutes. The result was a win for the College by 8 runs. For the College, Goodbody took 5 wickets for 22 runs, Glossop 3 for 61, and Harben 1 for 24. Score :—

R.A.C.		Swindon.	
H. Atkinson, b D. C. Morrison	54	R. Reynolds, c Walford, b Harben	20
F. Goodbody, l-b-w, b Warner	5	D. C. Morrison, st Walford, b	

E. Walford, c Wainwright, b Warner	11
G. Gunter, c Williams, b Morrison	13
G. Harben, b Dibsdale	4
D. Hervey, st McIlroy, b Morrison	15
L. J. Darling, c Warner, b Morrison	40
J. C. Tunstall, b Morrison	0
J. C. Bell, c Morrison, b Goodman	4
H. Beddall, not out	0
—. Glossop, b Goodman	0
Extras	15
Total	161

Glossop	20
E. G. Wainwright, c Bell, b Goodbody	26
S. Warner, run out	37
Dibsdale, l-b-w, b Glossop	16
C. Williams, c Gunter, b Goodbody	4
C. Webb, hit wicket, b Glossop	2
S. Morrison, b Goodbody	8
McIlroy, not out	8
C. H. Agar, b Goodbody	0
E. W. Goodman, b Goodbody	0
Extras	15
Total	153

R.A.C. v. STROUD.—Played at the College on July 11th on a hard and fast wicket. Stroud, winning the toss, batted first, and made 251 for 5 wickets. The College going in after fielding for three hours under a burning sun only scored 71. The game would have probably been reversed had the College won the toss. Score :—

STROUD.	
Huggins, l-b-w, b Harben	7
C. M. Smith, c Walford, b Harben	107
J. J. Stephens, c Hervey, b Gunter	53
F. Warman, b Goodbody	41
C. Merrett, c Goodbody, b Bell	17
J. Chambers, not out	10
Rev. Lale	Did not bat. Innings declared closed.
S. Darke	
H. Poole	
A. Green	
C. Stephens	
Extras	12
Total (5 wickets)	251

R.A.C.	
V. Stenhouse, l-b-w, b Huggins	0
W. Fosbery, b Huggins	4
H. Atkinson, c Merrett, b Poole	7
F. Goodbody, b Poole	1
G. Gunter, b Poole	5
E. Walford, c Warman, b Poole	6
L. Darling, c Huggins, b Poole	23
G. Harben, c Darke, b Poole	12
D. Hervey, b Huggins	1
J. C. Bell, b Huggins	3
P. J. Lindsell, not out	2
Extras	7
Total	71

R.A.C. v. EAST GLOUCESTERSHIRE.—This match was played at the College on July 14th, in brilliant weather. The visitors, who brought an exceptionally strong team, batted first, and put together 182 runs, F. H. B. Champain being the chief contributor with 60 runs. The College went in and made 115, being the losers by 67 runs after a very good game. For the College, Fosbery took 4 wickets for 31 runs, and Bell 5 for 73, Goodbody 1 for 26.

EAST GLOUCESTERSHIRE.	
F. H. B. Champain, c Walf'd, b Bell	60
J. N. B. Champain, b Bell	28
J. A. Healing, c and b Goodbody	15
E. W. Collins, st Walford, b Bell	9
H. Jessop, b Fosbery	13
F. D. Poole, b Fosbery	12
T. W. Taylor, not out	27
R. H. Ross, c Walford, b Bell	7
Westcott, c Walford, b Fosbery	2
O. Williams, c Harben, b Fosbery	3
Gould, b Fosbery	0
Extras	10
Total	182

R.A.C.	
H. Atkinson, c Gould, b Westcott	14
V. Stenhouse, c Jessop, b Westcott	3
W. Fosbery, c Ch'mp'n, b Westcott	23
F. Goodbody, c Jessop, b Westcott	8
E. Walford, b Gould	4
G. Gunter, c Williams, b Jessop	18
L. J. Darling, b Westcott	26
G. P. Harben, c Champain, b Jessop	3
J. C. Bell, c Champain, b Jessop	4
P. J. Lindsell, not out	4
H. Beddall, b Jessop	4
Extras	4
Total	115

Past v. Present.—Played at the College on July 18th and 19th in most brilliant weather. The College, winning the toss, batted first and began badly. Waring bowled with great effect, and took 8 wickets for 56 runs. The Past went in and fared as badly as the College, the College having a lead of 3 runs on the first innings. The College's second attempt proved as fatal as the first, the side being out for 126. The Past then went in and hit off the runs for the loss of 4 wickets. Lee, hitting with great freedom for the Past, made a fine 71 not out. Score :—

PRESENT.

H. E. Atkinson, b Waring	3	b Waring	9
V. D. Stenhouse, c and b Waring	5	b Lee	5
W. F. Fosbery, b Waring	0	b Lee	9
F. Goodbody, hit wkt., b Waring	5	b Lee	2
E. Walford, c Sutton, b Lee	3	l-b-w, b Lee	17
G. G. Gunter, c Lee, b Waring	48	c Sutton, b Waring	36
L. J. Darling, b Waring	2	b Lee	0
G. P. Harben, b Waring	6	b Waring	29
D. G. Hervey, b Waring	18	not out	1
J. C. Bell, not out	0	b Waring	0
S. Burrell, c Sutton, b Lee	1	c and b Lee	0
Extras	10	Extras	15
Total	101	Total	126

PAST.

P. T. Maw, st Walford, b Darling	1	b Darling	3
T. B. Wacher, c Walf'd, b Harben	6	b J. C. Bell	27
J. M. Gibb, b Harben	2	did not bat	
F. M. Lee, b Harben	20	not out	71
B. S. Cave, b Darling	25	b Gunter	4
W. Brocklehurst, b Darling	5	not out	15
T. T. Groom, c Fosbery, b Darling	14	c Harben, b Darling	2
T. H. Sutton, b Darling	0	Did not bat.	
F. W. Dawson, b Darling	11		
W. A. Waring, not out	4		
A. W. Finch run out	5		
Extras	6	Extras	8
Total	99	Total (4 wickets)	133

R.A.C. v. Tetbury.—Played at Tetbury on July 21st. The College, winning the toss, batted first, making a total of 166. Tetbury only succeeded in putting together 89, thereby leaving the College victorious by 77 runs. The College were greatly helped by the addition of W. Waring, who bowled with great success. Score :—

R.A.C.		TETBURY.	
H. Atkinson, c Henry, b Prout	0	F. Seal, b Waring	3
W. Fosbery, c and b Prout	3	H. V. Gillett, c Bell, b Waring	36
F. Goodbody, b Newman	30	C. P. Oldrey, l-b-w, b Harben	0
B. S. Cave, c Seal, b Prout	7	V. H. Stanley, c Harben, b Waring	18
E. Walford, b Prout	0	A. Prout, c Stenhouse, b Waring	6
V. Stenhouse, run out	13	E. N. Oldrey, b Harben	3
G. Gunter, b Gillett	58	Captain C. Henry, b Harben	8
W. Waring, c Lindsay, b Newman	0	D. Lindsay, c and b Waring	1
G. P. Harben, c Oldrey, b Prout	36	A. P. Kitcat, c Atkinson, b Waring	7
D. G. Hervey, b Newman	17	Newman, not out	3

J. C. Bell, not out	2	C. R. Soper, b Harben	0
Extras	0	Extras	4
Total	166	Total	89

The Season not being finished as we go to press we are obliged to hold over the report of two matches and the batting and bowling averages until our next issue.

REVIEWS.

THE COMPARATIVE VALUE OF NITRATE OF SODIUM AND SULPHATE OF AMMONIUM AS MANURES. By Robert Warington, M.A., F.R.S. Journal R. Agr. Soc., England. [3] XI. pp. 300-346. June, 1900.

This is a most careful comparison between the two most important nitrogenous manures, it is by one thoroughly well up in the subject, and is deserving of the careful study of the farmer. After digesting this paper the farmer will be in a far better position to judge correctly whether he should use nitrate of soda or sulphate of ammonia under any particular conditions. Mr. Warington discusses the reactions of these salts in the soil, and shows the importance of a supply of calcium carbonate in the soil when ammonium sulphate is used. He shows that the soda of the nitrate of soda is not unimportant on soils deficient in potash. The influence of the weather and especially of the rainfall, as illustrated by the results at Rothamsted and Woburn, is fully discussed. Other factors considered are the influence of time of application, of the presence of impurities—including potassium perchlorate in some samples of nitrate,—and the relative productiveness when the crops receive a full supply of cinereals or ash constituents. This is illustrated by results from long series of years of experiments at Rothamsted on Wheat, Barley, Oats, Meadow Hay, Potatoes, Sugar Beet, and Mangel Wurzel; at Woburn on Wheat and Barley; at R.A.C., Cirencester, on Barley, Oats, and Meadow Hay; and some Scotch experiments on Oats and Meadow Hay. In the majority of cases a given amount of nitrogen in nitrate of soda gives a larger increase than the same amount of nitrogen in sulphate of ammonia. The causes of this less return from ammonium salts is discussed; also the relative quality of the produce, which in the case of cereals is in favour of the ammonium salt. With roots, also, ammonium salts gave better quality at Rothamsted. A table is given to enable the farmer to estimate the value per ton of sulphate of ammonia with nitrate at various prices, and assuming that the nitrogen in the sulphate is of the same value as that in the nitrate, also of 5 per cent. less value, 10 per cent. less value, 15 per cent. less value, and 20 per cent. less value. Finally the author gives a Practical Summary which we reproduce practically in entirety.

1. On land containing no carbonate of calcium, sulphate of ammonium cannot be profitably used as manure, but nitrate of sodium may be.
2. On land containing a large amount of carbonate of calcium, sulphate of ammonium will seldom give its best return if applied as a top dressing. On such land the manure should be covered with soil by plough or harrow immediately after it has been distributed on the surface.

3. Sulphate of ammonium may often be used successfully as a top dressing on ordinary land, but it gives its best return most certainly when ploughed or harrowed in before sowing the seed. It is thus specially suited to spring corn and potatoes.

4. Ammonium salts do not become available as plant food till they have become converted into nitrate of calcium. This nitrification will not take place in a dry soil, in most arable soils it occurs quickly in showery weather.

5. Nitrate of sodium, being immediately available as plant food, and distributing itself in the soil more rapidly than nitrate of calcium arising from the nitrification of sulphate of ammonium, is generally more suitable for use as top-dressings to growing crops and for late applications.

6. The effect of sulphate of ammonium is always more gradual than that of nitrate of sodium, and is especially prolonged in soils containing little lime, in old grass land, and when associated with organic manures. This implies a longer continuance of growth in the crop receiving it, and results in some cases in a better quality of produce.

7. In a dry season nitrate of sodium always gives a better return for the same quantity of nitrogen, in a wet summer the advantage is frequently with the ammonium salt. This influence of climate is most clearly seen on cereals and grass land, and less clearly on potatoes and mangels which have a long period of growth.

8. The greater crop frequently given by nitrate of sodium is in part due to the soda which it supplies, this acting beneficially both in the soil and in the plant.

9. The produce yielded by sulphate of ammonium is more dependent on the presence in the soil of an abundant supply of cinereal plant food than is the case when nitrate of sodium is used. Kainite is an excellent addition to sulphate of ammonium.

10. On an average of ten series of field experiments with *Cereal Crops* continued throughout many years, when equal quantities of nitrogen in the forms of nitrate of sodium and sulphate of ammonium were applied to soils well supplied with potash, soda, and phosphates, the average return in corn was for 100 by nitrate 93 by ammonium salt, in straw for 100 by nitrate 79 by ammonium salt. The quality of the corn was a little better where ammonium salts had been employed.

11. In three series of field experiments on *Grass Hay*, conducted in the manner just described, the average return by ammonium salts of that given by nitrate was 85 per cent. when the first cutting of grass only was considered. When a second cutting of hay, at Rothamsted, was included, the ammonium salts gave 88 per cent. or more than the return of that given by nitrate.

12. With *Potatoes*, in the first ten years of the Rothamsted experiments the produce by ammonium salts was on an average fully equal to that yielded by nitrate of soda. Alkali salts and superphosphate were supplied in these experiments, but no dung.

13. With *Mangels*, the weight of roots yielded by ammonium salts during seventeen years at Rothamsted was on an average only 76 per cent. of that yielded by nitrate of soda. But the roots grown by ammonium salts were of superior quality, and taking this into account the return from ammonium

salts is probably 82 per cent. of that from nitrate. No dung was used, but alkali salts and superphosphate were used.

14. On *Turnips*, the farm experiments made in Scotland and the North of England, with small quantities of these manures, do not show any considerable difference in the effects of these two manures.
15. Low qualities of nitrate of sodium should be avoided, as it is possible they may contain an injurious amount of perchlorate of potassium. Low qualities of nitrate should be used for mangels rather than for cereals.
16. Sulphate of ammonium of average quality contains 24½ per cent. of ammonia. Nitrate of sodium of 95 per cent. purity contains nitrogen equivalent to 19 per cent. of ammonia. Nineteen pounds of sulphate of ammonium, therefore, supply as much nitrogen as 24½ lbs. of nitrate of sodium.
17. If the nitrogen in the two manures produced the same effect on crops, when nitrate of sodium was £8 a ton sulphate of ammonium would be worth £10 6s. Under various circumstances, described in the paper, the nitrogen in sulphate of ammonium is sometimes as effective as that in nitrate of sodium, and sometimes gives a smaller return.

NOTES ON FIVE YEARS' EXPERIMENTS ON HOP MANURING. By Dr. Bernard Dyer. London : Vinton & Co. 1900. 6d.

The object of these experiments, carried out in three different places in Kent, was mainly to ascertain how far nitrate of soda, in the presence of a proper supply of phosphates and potash, can be used advantageously as a source of nitrogenous food for hops. It seemed probable that the distrust felt in the use of nitrate for hops, due to having in some hands acted injuriously, was due either to its having been applied without a proper quantity of phosphoric acid or potash, or because it was applied too abundantly, or because it was applied at a wrong time, generally too late in the season, thus delaying the ripening period. The results of these experiments indicate that nitrate when applied judiciously is an excellent dressing for hops, increasing the quantity and improving the quality. This latter was reported on both by a brewer's chemist and also by a firm of hop-factors, so that the points of view of the grower and original vendor and also of the ultimate purchaser were considered. The nitrate must be used in conjunction with phosphates and potash, on soils rich in lime 8 cwt. per acre of superphosphate is suggested, on soils poor in lime 10 cwt. of basic slag, or bone dust, or guano is suggested. Where dung is liberally used the supply of potash in other forms will not often be necessary. Generally speaking, 6 cwt. of nitrate per acre may be applied with advantage, but it is necessary to apply it early in dressings not exceeding 2 cwt. at a time at intervals of a month, the first in January or February, and the last in April or May at latest. Dr. Dyer will continue the experiments for other seasons, but even now the results are of great interest and value to hop-growers.

LECTURES ON SOME OF THE PHYSICAL PROPERTIES OF SOIL. By Robert Warington, M.A., F.R.S. Oxford, at the Clarendon Press, 1900. pp. xv. and 231. 6s.

These lectures were delivered by the author as Sibthorpian Professor of Rural Economy at Oxford in 1896. The volume is excellently got up and printed by the Clarendon Press, and contains as a frontispiece a portrait of the late John Sibthorp, formerly Sherardian and Regius Professor of Botany in the University. The work shows the usual carefulness and thoroughness of the author, and certainly helps to fill a gap in the literature of Agricultural Chemistry and Physics long apparent in our language. The subjects are treated from an experimental point of view, and accounts of investigations on actual soils under known conditions are largely drawn on. The work of the American investigators Hilgard and King are specially drawn on, also some of the results obtained by Wolling, Mayer, Schloesing, and Lawes and Gilbert. The various lectures are devoted to the Physical Constitution of Soil, Relations of Soil to Water, Relations of Soil to Heat, and Movements of Salts in the Soil. Mr. Warington thoroughly appreciates the value of a study of the physical conditions and properties of soil, and sees that its neglect in the past is partly responsible for the want of appreciation of science by practical men. The good farmer knows the preponderating influence of a proper texture of the soil on the quantity and quality of the crop, and that a profitable return from an expensive manure is quite impossible unless the soil conditions are favourable ; text books as a rule have ignored these facts. It is possible in many cases to improve the physical conditions of a soil and make it more suitable for the production of a desired crop. Its retentive power may be increased, its evaporating power diminished, and its surface temperature may be increased by appropriate treatment ; illustrations of all these are given by the author. In the case of soils rendered barren by excess of saline matter—large areas of such soils exist in the United States, in India, and in Egypt—the salts may often, by skilful management, be prevented from coming to the surface and thus becoming harmful. As an illustration of the overwhelming importance of the physical conditions and climate on the productiveness of a soil it is mentioned that a narrow band of sandy soil in Florida, *very* poor in plant food, is worth up to £500 an acre for the cultivation of pine apples. A knowledge of the physical actions which go on in soils, and of the principles underlying these actions, will help the cultivator to control the actions and to make the best use of them. Mr. Warington's book is clearly written, it attacks subjects which are not so attractive as many parts of agricultural chemistry, but which cannot be neglected by the thoughtful farmer ; we should all feel grateful to the author for his labour in this field and trust that it is only the prelude to a more extensive treatise on the chemistry of the soil and the atmosphere. Thanks are also due to the Clarendon Press for producing the volume so handsomely at such a low price.

THE JOURNAL OF THE SOUTH EASTERN AGRICULTURAL COLLEGE, WYE, KENT. Ashford, Kent, Headley Bros. 1s.

No. 9 of this journal, dated April, 1900, contains two series of articles by Mr. F. V. Theobald, which students will find of considerable use. One is a "First Report on Insect Pests for 1899," and the other is an account of "Diseases caused by Horse-worms and their treatment." Mr. H. H. Cousins gives a description of some interesting experiments on "Fumigation with Hydrocyanic Acid" for pests difficult to deal with. The experiments tend to show that this method may be advantageously used in greenhouses and gardens, provided the proper precautions (which are fully given in the article) are taken : about two ounces of potassium cyanide to 1,000 cubic feet of space is enough. Among other items of more or less interest is one on the "Occurrence of moss in pastures," in which continued rolling, harrowing, and the treading of sheep are recommended as the treatment.

630.5
AGT

U OF ILL.
JUL 15 1942
PER. DUPS.
COPIES

NEW SERIES.

Agricultural Students' Gazette.

VOL. X. DECEMBER, 1900. No. 2.

SIR JOHN BENNET LAWES, BART., D.C.L., F.R.S.

By ROBERT WARINGTON, F.R.S.

The death of Sir John Bennet Lawes closes a remarkable epoch of personal work, the unfailing object of which has been the building up of exact agricultural science. Born in 1814, when Sir Humphry Davy had just ended his tentative course of lectures on agricultural chemistry, Sir John Lawes lived to see the immense development of the subject during the past century, and to take himself the largest share in this development. His extensive investigations carried out for sixty years at Rothamsted, the future maintenance of which he has insured by a liberal endowment, undoubtedly constitute his chief claim on our regard. But this is not all. His influence by his discourse and writings upon two generations of scientific investigators and practical farmers has been great indeed. We owe also to him the introduction of mineral superphosphate: the boon which this has been to farmers may be gathered from the fact that between 900,000 and 1,000,000 tons were manufactured in the United Kingdom in 1899.

The personal history of Sir John Lawes has been often told. He was descended through the female line from Jaques Wittewronge, who left Flanders about 1564 in consequence of the religious persecution then prevailing, and settled at Stantonbury, in Buckinghamshire. For his grandson, John Wittewronge, the manor of Rothamsted was purchased in 1623. The map of the home farm executed when this purchase was made is still among the archives at Rothamsted. John Wittewronge was created a baronet by Charles II.; he died in 1693. Through the failure of male heirs the estate of Rothamsted passed to the Bennet family by the marriage of Elizabeth Wittewronge with Thomas Bennet. It passed from them to the Lawes family by the marriage of Mary Bennet (great-granddaughter of James Wittewronge) with Thomas Lawes. Sir John Bennet Lawes, of whom we now write, was the grandson of Thomas Lawes.

Sir John Lawes was an only son; his father died when he was eight years of age. He received a careful home training from his mother, to whom he was much attached. She lived to see her son beome a great man, dying in 1875. John Lawes was educated at Eton and at Brasenose College, Oxford, but did not take a degree. In 1834 he commenced the personal management of the Rothamsted estate, and at once began to exhibit his taste for chemical investigations. An old barn was fitted up as a laboratory, and continued in use for nearly twenty years. The present writer well remembers this old barn: it has since been pulled down. The earliest chemical work was pharmaceutical, and included the manufacture of calomel. Experiments upon the effects of various manures upon plants in pots began in 1837, and increased in number in the two following years. It was these experiments which first indicated the advantage to be gained by treating bone ash and apatite with sulphuric acid. Trials of manures in the field began in 1840. In 1842 the patent was taken out for the manufacture of mineral superphosphate, and the first London manure factory was opened at Deptford Creek in the following year. In 1843 Dr. J. H. Gilbert was engaged to superintend the agricultural investigations at Rothamsted, and the systematic field experiments on turnips and wheat were commenced in this year.

Sir John Lawes was married in 1842 to Caroline Fountaine, daughter of Andrew Fountaine, of Narford Hall, Norfolk.

A most active and varied life had now been entered on. The great London business, the rapidly multiplying agricultural investigations, the local duties of a considerable landed estate, coupled with a large correspondence conducted without the aid of a private secretary, demanded powers of work of a very unusual description; but the vigorous mind in an equally vigorous body seemed always equal to the task, which was notably lightened by a wonderfully calm and cheerful temper rarely disturbed by the most untoward events.

In 1854 the present Rothamsted laboratory was commenced, and was presented to Sir John Lawes at a public gathering in the following year, in recognition of his services to agriculture. The full extent of the experimental fields (about 40 acres) was reached at the same time, the grass plots yielding their first crop in 1856. The annual "Memoranda," giving the produce obtained on all the experimental plots, began to be issued at this time.

It is quite impossible to enumerate in this paper the various investigations carried out at Rothamsted by Lawes and Gilbert; the number of publications named in the "Memoranda" of this year is 132. The subjects include many investigations relating to animals, but the majority of the reports are concerned with the results obtained in the experimental fields. These fields form indeed the most prominent feature of the Rothamsted experiments. Besides the formal Rothamsted reports, mostly drawn up by Dr. (now Sir) J. H. Gilbert, a great number of short papers were contributed by Sir John Lawes to various agricultural newspapers and periodicals, to some of which we shall have occasion to refer presently; he also lectured occasionally to various agricultural associations.

Sir John Lawes had early intended to provide for the maintenance of the experiments after his own death, and referred to this fact on the occasion of the opening of the new laboratory in 1855. After disposing of the manure business in 1872, he publicly announced that he had set aside £100,000, and certain areas of land, for the future maintenance of the investigations. In 1889 the transfer to trustees of the experimental land and buildings, with £100,000 in money, was formally executed. The management of the Rothamsted Experiment Station is now in the hands of a Committee nominated by the Royal Society, the Chemical Society, the Linnean Society, and the Royal Agricultural Society, the owner of Rothamsted being a permanent member.

On the completion of 50 years of joint work by Lawes and Gilbert, a Jubilee celebration was organised by the Royal Agricultural Society. The meeting was held on the lawn before the laboratory on July 29, 1893, the Right Hon. Herbert Gardner, M.P., the Minister for Agriculture, in the chair. Sir John Lawes and Dr. J. H. Gilbert were on this occasion presented with numerous congratulatory addresses, including one from the College at Cirencester: the former also received a portrait of himself painted by Herkomer, and the latter a piece of plate. Dr. Gilbert was shortly afterwards knighted by the Queen. A granite boulder, bearing a suitable inscription, was erected in front of the laboratory in commemoration of the Jubilee.

Sir John Lawes received many honours. The Queen created him a baronet in 1882. The Universities of Edinburgh, Oxford, and Cambridge conferred on him the degree of doctor. He received, with his colleague, one of the Royal Medals of the Royal Society, and subsequently the Albert Medal from the Society of Arts. The foreign distinctions showered upon him were equally numerous. His dislike of public life induced him to decline the presidency of the Royal Agricultural Society, and equally prevented him from occupying other public offices or performing public functions. The same spirit has been often found in genuine workers, whether scientific or artistic; the production of work has been to them the only sufficient object of life.

We need not seek for more characteristic examples of Sir John Lawes' genius than are supplied by the four short articles contributed by him to the *Agricultural Students' Gazette* between 1882 and 1895. The first three are very short, and have evidently been hastily thrown off in scanty intervals of leisure. The fourth is longer and somewhat more formal; it was written when he was over 80 years of age. Each of these papers is highly original. They are not the utterances of a lecturer expounding a science. They do not bring before us finished pieces of work, for every step of which proof can be offered. What they show us is the working of the mind of an ardent investigator. For him the borderland between the knowledge already won and the realms of ignorance yet unexplored is the region of greatest interest, the scene of the daily delightful struggle for fresh light and information. To such an one the conquests already achieved belong to the past, and the present is ever occupied with new problems requiring fresh labours. This is the spirit which conquers nature, and it is to such that she loves to discover her secrets. This is also the genius which infects others with its own enthusiasm, and by thus multiplying the number of investigators accomplishes far more for the advancement of knowledge than can be done by a single life's work.

Notwithstanding this enthusiasm, which old age seemed never to diminish, Sir John Lawes' mind was eminently practical and judicious, and new theories or methods were received by him with much caution. Being himself a farmer, he was ever mindful of the conditions under which farming must be carried on, and as he could not promise the farmer a large increase in his crops, or a considerable rise in prices, he was regarded by some as a pessimist. Improvement in the state of agriculture, indeed, can only come by attention to numerous details. Sir John Lawes told the farmer that it was foolish to give an extravagant price for linseed cake when decorticated cotton cake would produce a similar result at far less cost. He pointed out that the manure value of a food must always be taken into account if feeding is to be carried out with economy. He laughed at the farmer's practice of selling his fat beasts without weighing them. He further proceeded to help the farmer in a most practical way by publishing tables showing the relative manure value of different foods, and the probable weight of butcher's carcase in fat beasts of varying quality of which the live weight has been ascertained.

Sir John Lawes was a man of splendid constitution and great physical vigour. In English field sports he took no part, but during his holidays in Scotland deer-stalking and salmon fishing were his chief recreations. His vigour continued into old age, and up to a few days before his death he was going as usual to London, and visiting his chemical factory at Millwall. His death, due to an attack of dysentery, occurred on August 31 of the present year, in the 86th year of his age. He is succeeded by his son, Sir Charles Bennet Lawes, the well-known sculptor.

It may be of interest to students of the College if I refer in conclusion to the past relations between the College and Rothamsted. I cannot speak of any intercourse which may have occurred before my own time. When I became assistant to the Professor of Chemistry at the College in 1862 I had already spent one year (1859) in the Rothamsted laboratory, being then occupied with ash analysis. In 1864 I began occasional lectures to the College students on the results of the Rothamsted experiments, the first two lectures being the re-delivery of Sir John Lawes' Dublin lecture on "The Chemistry of the Feeding of Animals for the Production of Meat and Manure." The diagrams used at Dublin were kindly sent down to Cirencester for these lectures. I afterwards went systematically through the whole of the experiments on crops and animals, giving in the course of two years about twenty lectures. For these lectures a great deal of unpublished information was kindly supplied by Lawes and Gilbert. While working in the College laboratory I also made the first analyses of the ashes representing the whole bodies of a fat ox, sheep, and pig, the ashes being sent from Rothamsted. I left Cirencester to become chemist to Sir John Lawes' factories, and in 1876 again took up work in the Rothamsted laboratory. Sir J. H. Gilbert was made Honorary Professor of Chemistry at the College in 1885, and has delivered six lectures there on some of the recent results of the Rothamsted experiments. The articles communicated by Sir John Lawes to the *Students' Gazette* have been already referred to; their titles will be found below. The students and Professors of the College have in recent years made many delightful summer excursions to Rothamsted, and have thus seen for themselves the work which is there conducted. May the connection between investigation and teaching ever continue.

List of Papers in the *Agricultural Students' Gazette*, New Series, by Sir J. B. Lawes, Corresponding Member of the R. A. College:

THE FUTURE OF AGRICULTURAL FIELD EXPERIMENTS: Vol. I., Pt. 3; December, 1882.

REMARKS ON THE PRODUCTS OF THE COW: Vol. II., Pt. 5; December, 1885.

NUTRITIVE RATIOS: Vol. VI., Pt. 1; August, 1892.

UPON SOME PROPERTIES OF SOILS WHICH HAVE GROWN A CEREAL CROP AND A LEGUMINOUS CROP FOR MANY YEARS IN SUCCESSION: Vol. VII. Pt. 3; April, 1895.

In conjunction with Sir J. H. Gilbert, as Lectures given at the College by Sir J. H. Gilbert:

ON THE GROWTH OF WHEAT: Vol. II., Pt. 4; August, 1885.

RESULTS OF EXPERIMENTS AT ROTHAMSTED ON THE GROWTH OF BARLEY: Vol. III., Pt. 1; August, 1886.

RESULTS OF EXPERIMENTS AT ROTHAMSTED ON THE GROWTH OF ROOT CROPS: Vol. III., Pt. 5; December, 1887.

RESULTS OF EXPERIMENTS AT ROTHAMSTED ON THE GROWTH OF POTATOES: Vol. IV. Pt. 2; December, 1888.

RESULTS OF EXPERIMENTS AT ROTHAMSTED ON THE GROWTH OF LEGUMINOUS CROPS: Vol. IV., Pt. 5; December, 1889; and Vol. IV., Pt. 6; April, 1890.

RESULTS OF EXPERIMENTS AT ROTHAMSTED ON THE QUESTION OF THE FIXATION OF FREE NITROGEN: Vol. V., Pt. 2; December, 1890; and Vol. V., Pt. 3; April, 1891.

The Text of the R.A.C. Address at the Rothamsted Jubilee is in Vol. VI., p. 107.

For financial aid, which enabled us to reproduce the accompanying portrait of Sir John B. Lawes by the Photogravure process, we are indebted to the following Old Students and friends:—

Charles Bathurst, jun.
A. G. Bloxam
C. Cecil
Professor A. H. Church
Professor W. McCracken
T. A. Dickson
E. Druce
C. C. Duncan
J. H. Dugdale
James Edwards
A. W. Finch
Dr. William Fream
F. A. Garden
F. S. Goodbody
W. T. Hall
J. J. Harle
E. B. Haygarth
J. N. Heathcote
J. Hendrick
J. H. Milne Home
J. A. Ross Hume
A. Hutchings
J. C. Kennedy
J. W. Kenyon
James Mason
J. Maughan
P. T. Maw
A. Nettlefold
G. H. Nevile
J. H. Oakley
E. C. Ozanne
J. S. Remington
H. H. Robinson
J. H. Simpson
J. E. H. Stooke
Leonard Sutton
T. H. Sutton
C. J. Tunstall
S. R. Vernon
S. Vlasto
E. Waller
H. C. Waterfield
H. F. Waring
A. I. Whitaker
C. E. O. Wilkinson
J. M. Wood

FARMING IN NATAL.

To those contemplating a farmer's life in the British Colonies, Natal probably offers as favourable a prospect as any.

One must of course be prepared to devote himself for the time being to his work, to be reasonably patient, and to do his best to understand the natives and their ways, and the local requirements, but given a man thus willing, an average farm in Natal would probably bring him as good a return and result, and as quickly and cheaply and under as pleasant conditions as he is likely to find in any other colony.

In my opinion Natal has a bright future before it. The chief advantages that it offers to a farmer are the comparatively small capital he will require, the healthy climate, and the increasing prospects of good and improving markets. Even in past years, with so many and great elements of a disturbing character around, the trade and prosperity of the Colony have continuously increased. Now, when those disturbing elements are on the eve of removal, one can hardly be considered over sanguine in expecting that the improvement will continue and even be improved upon.

There are of course drawbacks to be encountered. One has not the same troubles and difficulties as in England, but there are others. One must always expect such in some form or other, and none the less in a tropical or nearly tropical country.

In Natal, the principal drawbacks that one has to expect sooner or later, and at one time or another, are horse sickness, locusts, hail-storms, and drought, and one must not be surprised on occasions at rinderpest, rust, and other diseases both to stock and crops. In all colonies these or other troubles are the natural experience of the farmer. But in spite of all this, nature generally supplies some compensation, and in the matter of difficulties I think Natal will probably compare favourably with any other Colony.

Natal is, generally speaking, mountainous. Up-country districts offer excellent opportunities for stock-breeding. Districts nearer the coast are better adapted for agriculture, fruit, and the wattle. The cultivation of the wattle tree (*Acacia mollissima*) for its bark is a very important industry, to which more attention is being given every year.

Stock breeding is, perhaps, the most popular, and, as I think, the most pleasant, occupation, but naturally requires rather more capital, and more time to reach the profit-earning stage, than the other industries I have mentioned.

One of the most important points in connection with stock breeding is the provision of winter food, and the protection of your herds and flocks from losses by theft and accident.

In winter it is essential to bring your stock into lower and more sheltered farms, whilst in summer the high lands are preferable. In my own case, I am fortunate in having farms both for winter and summer grazing, but many have the one or the other only, and to such more particularly it becomes of great importance to grow sufficient food for the stock for winter use, for the veldt, which is abundant in summer, soon becomes dried up in winter.

It may not be out of place to give one word of warning. No one should suppose he can successfully manage a farm in Natal without experience of, and paying due regard to, local conditions and the ways and character of the native. One is so dependent upon natives for labour, that it is all important to study them. It is fatal to come out with preconceived ideas and to ignore facts as they are, or to suppose one can alter everything to one's own way of thinking by a mere nod of the head. It may perhaps seem superfluous to write thus, and yet this is exactly what many do. It is to this that some of our disasters in South Africa during the present war are I think partly attributable. Disregard of local character and conditions, and spurning of advice from those who from years of personal experience are able to give it, is a fatal mistake to make.

With ordinary intelligence and observation, however, one should be able in, say, two years, to learn sufficient of the local conditions and the ways of the natives to enable him to manage for himself.

Farming in South Africa is so very different from that in England, that I make no apology for emphasizing the importance of not being in too great a hurry to begin. Those who have farmed in this country will probably find it more difficult than others to adapt themselves to the requirements of the new country. But to endeavour to work in the Colony on entirely English ideas would simply mean disaster.

In an article of this character, it is not of course possible to give anything more than a general idea of the subject in hand, but as an old R.A.C. student myself, I shall always be very pleased to give the benefit of my experience to any other student of the College who would like to pursue the matter further.

P. W. Kimber.

OF THOMAS TUSSER.

"FIVE HUNDRED POINTS OF GOOD HUSBANDRY."

The book I have in mind is square and flat, of the size known to publishers as "Pott" 8vo., is bound in calf that in 1672, when the copy I refer to first appeared, was probably yellow, now of a rich marbled brown. The pages are in black letter with wide margins, but it is surprising what a lot of black-letter printing can be crammed into a page, especially when, as in this case, the writer frequently waxes eloquent in double columns of verse. There is no doubt that black letter takes a deal of reading, accompanied by close application: indeed one careful student of the "Five Hundred Points" gives it as his opinion that Thomas Tusser can only be properly appreciated when read aloud. Would Agricultural handbooks receive closer study I wonder if printed in black letter?

It is not, however, from the Agricultural standpoint that I would venture to discuss the versatile Thomas, but rather from that of one who loves old books, above all, old books so redolent of "atmosphere" as is this quaint *vade mecum* of the Agricultural year.

That the writer's Husbandry is comprehensive as well as good may be gathered from the title page, which proclaims it to be "as well for the champion or open country, as also for the woodland or several, mixed in every moneth, with Housewifery, over and besides the Book of Housewifery . . . . with divers lessons, as a diet for the farmer, of the properties of winds, plants, hops, hearbs, bees, and approved remedies for sheep and Cattel, with many other matters both profitable and not unpleasant to the Reader." Under this last heading he would probably include "Supper Matters" and "The Ploughman's Feasting Days," which seem at that time to have been fairly numerous, for in addition to the usual feasts of the church we find such gaudy days as "Plough Monday," "Wake-Day," and "Seed-Cake," and the farmer's wife is enjoined to keep these festivals.

It is plain that no such conception as that of the piano-playing, dog-cart driving farmer's wife of our day had ever crossed Thomas Tusser's brain. The whole duty of the wife of a Good Husbandman is set forth at appalling length and is awe inspiring in its multitudinous character, including as it does chapters on "Housewifely morning works, Housewifely breakfast works, Housewifely Admonitions or Lessons, Brewing, Baking, Cookery, Dairy, Scouring, Washing, Salting, Dinner-time Housewifry, Housewifely Afternoon works, Housewifely Evening Works." Here one pauses breathless with the hope that now at least the poor woman will have leave to sit down and rest her awhile, but no! the inexorable Thomas devotes further fourteen couplets to "After Supper Matters," which include "The Feeding of the Dog," "locking up," and finally—

"Declare after supper, take heed thereunto,
What work in the morning each servant shall do."

and as in summer-time the day began at four a.m., ending at ten at night, we may conclude that the good lady and her handmaids had earned their six hours sleep. It is small wonder that Thomas declines to consider seriously the existence of a bachelor farmer: he dismisses the question in a couplet—

> "Some husbandly thriveth that never had wife,
> Yet scarce a good husband in goodness of life."

In the dedication to "Lord Thomas Paget of Beaudesert" it is curious to come upon Mr. Swinburne's favourite metre—

> "My Lord your father loved me,
> And you my Lord have proved me,
> And both your loves have moved me,
> To write as I have done,
> Since God hath hence your Father,
> Such flowers as I gather,
> I dedicate now rather,
> To you my Lord his son."

This "Epistle" as it is called continues in the same strain for some 143 lines, then follows an "Introduction to the Book of Husbandry," "A preface to the Buyer of this Book" (Thomas is ever lavish of capitals), "The Description of Husbandry" "The Ladder to Thrift,"—which contains such admonitions as—

> "To take thy calling thankfully.
> and shun the path to beggary.
> To grudg in youth no drudgery,
> to come by knowing perfectly.
> To count no travel slavery
> That brings in penny favourly."

followed by "Good Husbandry Lessons worthy to be followed of such as will thrive," and "The Farmer's Dayly Diet," in which occur the familiar lines—

> "At Christmas play and make good chear,
> For Christmas comes but once a year."

According to this authority the farmer's year begins in September.

Having dieted his ideal "Good Husband" and made a few observations —always in verse—on such side issues as "the Property of winds in all the times of the year," he proceeds to give "September's Abstract," and all the months in turn are similarly and exhaustively dealt with. Although his discourse includes every kind of farming he has his preferences, for in the chapter headed "A Comparison between Champion Country and Several" he remarks—

> "The Country inclosed I praise,
> the tother delighteth not me,
> For nothing the wealth it doth raise
> to such as inferior be."

and he proceeds to sing the praises of Suffolk and Essex where "inclosure" brings—

> "More plenty of Burton and Beef,
> Corn, butter, and cheese of the best."

contrasting them with Norfolk and Cambridge where—

"The flocks of the Lords of the soil
do yearly the winter-corn wrong.
The same in a manner they spoil
with feeding so low and so long."

He also complains bitterly of the conduct in these parts of "The champion who robbeth by night, and prowleth and filcheth by day," and

"The Ox-boy—as ill is as he,
or worser if worse can be found,
For spoiling from thine and from thee,
of grass and of corn on the ground."

In a "Dialogue between two bachelors, of wiving and thriving—by Affirmation and Objection" he sets forth his views upon matrimony generally, though these same views crop up continually throughout the book. He is never tired of singing the praises of a suitable helpmeet for the "good husband," and like Tennyson's "Northern Farmer" never fails to point out the expediency of "going where money is."

"St. Bernard's Verses" are given in Latin and English, preceded by a long poem setting forth the "Author's Belief," and the work concludes with a rhymed record of the "Author's Life." Thomas is nothing if not personal, and does not spare the reader a full description of his every residence, with a detailed account of his various ailments together with those of his wife.

A shrewd, garrulous, kindly person this Thomas! Ever eager to point a moral and improve the occasion, but human withal, having achieved a philosophy untinged by cynicism not inaptly summed up in the lines—

"Some seek for wealth, I seek my health,
Some seek to please, I seek mine ease,
Some seek to save, I seek to have,
to live upright."

L. ALLEN HARKER.

Thomas Tusser was born at Rivenhall, in Essex, about the year 1525, he died on May 3rd, 1580. At a very tender age he was placed by his father (see chapter 113, "On the author's life") as a singing boy in the Collegiate Chapel of the Castle of Wallingford, Berks. Afterwards he was admitted to the choir of St. Paul's Cathedral, where he acquired considerable proficiency in music under the tuition of John Redford, the organist and almoner. Thence he went to Eton, probably in 1541; from Eton he passed on to King's College, Cambridge, in 1543: but afterwards removed to Trinity Hall, of which he always retained pleasant memories. He left the University on account of a long illness, and joined the Court as a retainer of William, Lord Paget; here he remained ten years, when he retired to the country, married, and settled down as a farmer at Cattiwade, a hamlet in the parish of Brantham, in Suffolk, and it was here that he composed his "Hundreth Good Pointes of Husbandrie," which first was published in 1557. We find him afterwards living at Ipswich, West Dereham in Norfolk, at

Norwich, where he was a lay clerk or singing man in the Cathedral, at Fairsted, near Witham, in Essex, and then in 1572 in St. Giles's, Cripplegate, London. The plague breaking out, he returned to Cambridge in 1573, to his favourite Trinity Hall, where he appears to have been employed in the choir. He died in London and was buried in the Church of St. Mildred, in the Poultry, where formerly was a monument (Stow's Survey of London, 1618; St. Mildred's was destroyed in the Great Fire) to his memory, with the following inscription, very probably written by Thomas himself :—

> "Here Thomas Tusser, clad in earth doth lie,
> That sometime made the Poyntes of Husbandrie ;
> By him then learne thou maist, here learne we must,
> When all is done we sleepe and turne to dust,
> And yet through Christ to heaven we hope to go,
> Who reades his booke, shall find his faith was so."

It has been a common opinion that Tusser died in poverty, thus Fuller, in his "Worthies of Essex," says, "Whether he bought or sold, he lost, and when a renter impoverished himself, and never enriched his landlord ; he spread his bread with all sorts of butter, yet none could stick thereon." And Peacham, in "Recreations for ingenious Head Pieces," with the device of a whetstone and a scythe, has the following :—

> "Tusser, they tell me, when thou wert alive
> Thou, teaching thrift, thyself could'st never thrive :
> So, like the whetstone, many men are wont
> To sharpen others, when themselves are blunt."

However, judging from his will, which shows that he had lent his brother a considerable sum and was the owner of two small farms, he could not have been quite so unfortunate. No doubt his love of hospitality, which was a very marked feature of his character, as well as a roving disposition, tended to keep him poor.

As above noted, the first edition of his "Hundreth Good Poyntes" appeared in 1557 : from that date till the end of the sixteenth century not less than thirteen editions of his work (augmented as below) are known to have been published. All are scarce and few copies are perfect, they bear evidence of practical use. The edition of 1570 was entitled, "A hundreth good pointes of husbandry, lately maried unto a hundreth good poynts of huswifry : newly corrected and amplified, with dyuers proper lessons for householders, as by the table at the latter ende more plainly may appeare. Set forth by Thomas Tusser, gentleman, servant to the right honorable lorde Paget of Beudesert." The first edition of the "Five hundred Points" was printed in 1573, its title is—"Five hundreth pointes of good husbandry, united to as many of good huswifery, first devised and more lately augmented, with divers approved lessons, concerning cropps and gardening and other needful matters, together with an abstract before every moneth, containing the whole effect of the sayd moneth, with a table and a preface in the beginning, both necessary to be reade, for the better understanding of the booke. Set forth by Thomas Tusser, gentleman, servant to the honorable lorde Paget of Beudesert. Imprinted at London in Flete Street within Temple Barre, at the signe of the hand and starre, by Richard Tottell. Anno 1573. Cum privilegio."

In the seventeenth century, seven editions appeared, and up to this time all were in small quarto and black letter. The eighteenth century saw a new edition in 1710, and a reprint with a new title-page in 1744. In 1812 "A New Edition with Notes, Geological, Illustrative, and Explanatory, a Glossary and other Improvements, by William Mavor, LL.D. (Rector of Woodstock), Honorary Member of the Board of Agriculture," was printed, and dedicated to the President and Members of the Board of Agriculture. The latest edition was published in 1878 for the English Dialect Society, by Trübner & Co.: it was edited, with introduction, notes and glossary, by W. Payne and Sidney J. Herrtage. It is from the edition of 1580, collated with those of 1573 and 1577, and contains a reprint, from the unique copy in the British Museum, of "A Hundreth Good Pointes of Husbandrie," 1557; also a reprint of the "last Will of Thomas Tusser." To the biographical sketch in this edition we are indebted for nearly all the above notice of our good natured, cheerful and generous author. ED.

AGRICULTURE IN THE ISLE OF WIGHT.

Farming in the Isle of Wight is of the most varied description, due to good climate and the many geological formations. On the north side, extending from Yarmouth to Bembridge, and inland to the Chalk Downs (which run through the middle from east to west) we have the Tertiary Eocene Formation, this soil is generally stiff and cold, and is mostly under grass. The soil on the Bembridge Limestone which runs the whole length of the Island is an exception, being good land and will grow anything well, barley, wheat, oats, grass, and fruit. Harvesting commences earlier than on any other part of the Island.

Then the London clay, most unprofitable to cultivate, and now mostly in grass of poor quality. The Chalk Formation embraces the rest of the Island, with the exception of a small piece on the Wealden. First, the Upper and Lower Chalk, for the most part Downs rising to 700 ft. above sea; they are covered with a scanty herbage, and used for a turn out for sheep during the day. Secondly, the Galt, which is a stiff blue clay,* and now all down in grass of good quality, and runs the whole length of Island about a quarter of a mile wide. Thirdly, the Upper and Lower Greensands; the Upper is good grazing and corn land, the Lower grows the best malting barley and roots, very easily worked, and pleasant land to farm.

Dairying is carried on extensively throughout, the visiting and large permanent population making a good demand for butter and poultry. The cows are mongrels, being much crossed with the Jersey, Guernsey, and some Shorthorn.

---

* Between the Upper and Lower Greensands.

Dorset Horns are the principal breed of sheep, and the lambing season is now on. Unless the weather is very bad, the ewes are kept quite in the open, a few roots thrown on the grass, over which they are hurdled, coming into a closed pen at night (for the shepherd's convenience), and have hay. The ewes as soon as they lamb are put in front of the hurdles for two or three days, then moved to the young seeds, where they have a few roots thrown about. At three weeks they are hurdled on the white turnips, and the lambs are finished off on the swedes and mangels about March. Ewes have cotton cake and corn, and the lambs (who are allowed to go through the lamb hurdle) have linseed cake, peas, and cut swedes. Years ago this early lamb business was profitable, but now it is spoilt by Australian lamb, and many of the Hampshire ewes come in much earlier than they did twenty years ago.

As to climate. The south side is, I think, quite equal to the Middle Island, New Zealand, from Blackgang to Brook, very bracing in summer and mild in winter, fuchsias, myrtles, &c., flourish in the open, and roses are still in bloom.

The Island is a most interesting place to the geologist, botanist, and archæologist. Our beautiful churches and Elizabethan manor houses are numerous and most interesting, telling a tale of the agricultural prosperity of years ago. Unfortunately for those whose living has to be got from the land times are now changed, but we still have left "that beautiful Island, which he who once sees never forgets."

Henry Way, M.R.A.C.

AT THE FRONT.

Mr. R. S. Britten, of the 10th Imperial Yeomanry, has been promoted to a lieutenancy in that Battalion.

Mr. H. E. Milburne, 13th Battalion Imperial Yeomanry, has returned home.

Second Lieutenant Lord G. R. Grosvenor, Scots Guards, was wounded in the thigh, whilst gallantly leading his company at an engagement near Bethlehem, on October 21st.

Mr. E. Atkinson, M.R.A.C., 5th Battalion Imperial Yeomanry, was badly wounded in the leg below the knee by a bullet some weeks ago. He, with two companions, went to take a waggon, flying the white flag, and when about sixty yards off were fired at from the waggon. Two of the horses were killed, the third wounded. Atkinson was in ox-waggons and mule ambulances for four weeks, but on October 25th was in the Hospital at Pretoria going on well and the wound was healing.

Lieutenant C. H. Gresson, of Roberts's Horse, was slightly wounded at Krugersdorp on November 14th.

Mr. C. Cooper, 40th Company Imperial Yeomanry, has returned home, invalided.

ROYAL AGRICULTURAL COLLEGE CLUB.

The annual dinner of this Club took place at the Holborn Restaurant on Wednesday, December 12th. Professor Ohm was in the chair, and the members of the Club rallied round him in full force. The attendance was well above the average of recent years, and the ex-Professors and Students represented many generations of R.A.C. men. The following were among those present :—Professor Hugo Ohm, Dr. J. A. Voelcker, Professor H. A. Woodruff, and Messrs. John D. Whittaker, T. J. Elliot, Edwin Fox, F. E. Harman, Cecil H. Hooper, Edric Druce, A. G. Scorer, S. Vlasto, W. P. Simon, A. G. Bloxam, Herbert M. Webb, Archibald Butler, R. C. Butler, E. Powell King, J. H. Simpson, R. Alderson, Horace C. Waterfield, E. Brettell Vaughan, F. S. Tanner, M. M. Holl, Thomas R. Cholmondeley, J. H. Dugdale, W. Ryder Richardson, A. H. Greaves, T. A. Dickson, Sydney R. Vernon, Wilfrid Eaton, H. A. C. Warmington, Charles Bathurst, jun., and Bruce Swanwick.

The speeches were very limited in number. Following the loyal toasts from the Chair, Mr. T. A. Dickson had a congenial task in the Services toast, to which Mr. Charles Bathurst responded.

Mr. Bathurst proposed the Royal Agricultural Society, leavening his praise with a little wholesome criticism. Dr. Voelcker, an old and valued guest of the Club, responded, and also proposed the toast of the evening, "The College and Professor Ohm." It goes without saying that this was received with enthusiasm, and the Chairman in his reply touched upon many humorous episodes of his College career, each of which found a soft place in the memory of one or other of his hearers.

General regret was felt at the absence of Mr. Haygarth, the secretary and mainstay of the Club. It is pleasing to record that the feeling was unanimous that he should be the first Chairman of the new century.

A very pleasant evening concluded with the singing of "Auld Lang Syne."

LITERARY AND DEBATING SOCIETY'S MUSICAL ENTERTAINMENT.

A concert was held on Monday, November 19th, in the out-students' room. Its success was greatly due to the invaluable services of Miss Marshall, who, besides giving two capital pianoforte solos, helped considerably as an accompanist. We were also lucky in securing the assistance of Mr. E. C. Cripps, to whom we are indebted for two songs. A patriotic song by Professor Blundell was vociferously encored. Mr. Walford sang a very amusing parody on "I want to be popular," in costume, and as an encore sang a topical verse written for the occasion. Mr. Stenhouse's bosom friend, "Mr. Clay," was more amusing this year than ever. The Principal read a very appropriate poem, "The Charge of the Light Brigade." The concert ended up with the amusing duet, "Upper Ten and Lower Five," by Messrs. Harben and Walford. Before breaking up, Mr. Milburne, an old student, recently returned from South Africa, was called upon for a speech, and enthusiastically greeted.

The programme of the concert is here given.

PART I.

Pianoforte Solo		Miss Marshall
Song	"Old English Love Song"	Mr. Sawyer
Song	"When Father laid the carpet on the stairs"	Mr. Wright
Reading		The Rev. J. B. McClellan
Song	"I want to be popular" (parody)	Mr. Walford
Song	"Venetian Love Song"	Mr. Cripps
Violin Solo	"Moto Perpetuo" *(Carl Bohm)*	Mr. Harben
Song	"Old England"	Mr. Blundell
Song	"The Admiral's Broom"	Mr. Stenhouse

PART II.

Pianoforte Solo	"Shepherds' Dance"	Miss Marshall
Song	"And so do I"	Mr. Wright
Song	"The Boatswain's Story"	Mr. Pennington
Gramaphone		Mr. Radford Rowe
Song		Mr. Cripps
Song	"When the boys come home"	Mr. Blois
Banjo		Mr. Bisdee
"Mr. Clay"	and	Mr. Stenhouse
Vocal Duet	"The Upper Ten and Lower Five"	Messrs. Walford & Harben

The thanks of all are due to the energetic Secretary of the Literary and Debating Society, Mr. G. P. Harben, for the care and skill with which he prepared and decorated the room.

LITERARY AND DEBATING SOCIETY'S DRAMATIC ENTERTAINMENT.

The Literary and Debating Society are to be congratulated upon their extremely successful dramatic entertainment upon Tuesday, December 5th, when they produced a comedietta entitled "Bubbles," followed by the farce named "Freezing a Mother-in-law."

The following was the cast :—

BUBBLES.

A Comedietta in One Act, by C. S. Fawcett.

Dramatis Personæ.

Christopher Hogg, Esq. (a retired pork butcher)	Mr. E. Walford
Bob (his son)	Mr. G. P. Harben
Sir Thyngammy Tallboy, Bart. (chairman of Trans-atlantic Balloon Service Co.)	Mr. H. A. V. Bonnin
Smees (servant)	Mr. G. S. Bisdee
Adele (Tallboy's daughter)	Mr. A. Wallis-Wilson
Polly (Hogg's niece)	Mr. E. W. Farwell
Mrs. Hogg	Mr. H. E. Dennis

Scene ... ... Hogg's Villa.

Prompter ... Mr. J. Aspinall. Stage Manager ... Mr. H. A. V. Bonnin.

FREEZING A MOTHER-IN-LAW.

A Farce in One Act.

Dramatis Personæ.

Mr. Whatmuff (attached to the past)	Mr. V. D. Stenhouse
Ferdinand Swift, his nephew (attached to fortune hunting)	Mr. J. M. Bateman
Walter Litterland (attached to Emily Whatmuff) ...	Mr. R. H. Keane
Mrs. Whatmuff (attached to the memory of her parents)	Mr. W. J. Fosbery
Emily, her daughter (attached to Walter Litterland) ...	Mr. R. Hartley

---

Scene ... ... Room in Mr. Whatmuff's house.

Stage Manager ... Mr. V. D. Stenhouse.

Prompter ... Mr. G. Ashton Smith. Scenery Painter ... Prof. Paton.

Stage Carpenters and Scene Shifters—
Messrs. Gruning, Lindsell, Irwin, and Hancock.

This plan of introducing two plays instead of one, though having the advantage of including a greater number of aspirants to histrionic fame had also the marked disadvantage of excluding Mr. Stenhouse, who can be relied upon to ensure the success of what might otherwise be a very moderate performance.

The curtain raiser struck us as a poor play, the ladies' parts in particular being unattractive, and had the acting reached a lower standard the result would have been a most bitter disappointment. Thanks to Mr. Bonnin's stage management and coaching, the actual distribution of the performers seemed to be affected with clockwork accuracy ; his vigorous acting in the part of Sir Thyngammy Tallboy, the company-promoter and quack doctor for those suffering from a heavy purse, helped in no small degree the success of the piece. He was very good in the scene in which he explains to his daughter the exact relations existing between himself and the Hogg family, the affected manner of his speech, however, had too great a tendency to drawl.

Mr. Walford, as Christopher Hogg, was the mainstay of the piece, the studied vulgarity of the retired pork butcher being at times very amusing, whilst his righteous indignation at Sir Thyngammy for mistaking his niece Polly for the cook was perhaps his finest effort. In the scene where he explains to Bob his views of the relative merits of Polly and Adele we were led to note the fact that his annoyance was fraternal rather than paternal, his acting otherwise being excellent ; indeed, we were surprised that his merit was not recognised by a call before the curtain.

The Bob of Mr. Harben was most amusing in the proposal scene with Adele, and in this he was certainly well supported by Mr. Wallis Wilson, whose impersonation of the part was greatly assisted by the fact that he distinctly looked a feminine iceberg ; he had, however, to wrestle with a voice, which, though never too loud, was occasionally too deep.

The minor parts were satisfactorily sustained; Mr. Farwell in the uninteresting part of Polly was particularly successful when making the pathetic announcement of her unrequited love and intending departure from her guardian uncle's home.

During the interval Mr. Charles Cripps very kindly favoured us with a song, after which "Freezing a Mother-in-law" was proceeded with, and certainly the good wine was kept, if not to the last, at least until Mrs. Whatmuff had been frozen.

Mr. Stenhouse in the principal *rôle* is to be congratulated not only upon his acting and stage management, but also upon his recovery from his indisposition which threatened to deprive us of the mainstay of the piece. He was specially amusing in his pleasure over the freezing process, and the enjoyment of his twenty-year-old port; he had unfortunately small opportunity for the introduction of his specialities in the way of College jokes.

It was really surprising that, after being deprived of his most useful coaching during the later rehearsals, the remaining members of the cast acquitted themselves with uniform excellence, and, a matter of extreme importance, spoke their lines distinctly and to the audience.

The American accent of Mr. Bateman as Ferdinand Swift, as also the lisp of Mr. Hartley as Emily, and the imposing stage walk of Mr. Keane as Walter were well sustained throughout the performance. Mr. Bateman played the wild adventurer with much success, lending assistance to Mr. Stenhouse in maintaining the audience in a merry frame of mind. We congratulate Emily on her excellent figure and the good taste in which she dressed, as also upon her ladylike embrace.

The Mrs. Whatmuff of Mr. Fosbery was a most sedate, solemn, aristocratic, and withal thoroughly ladylike representation, though possibly not what the author anticipated.

The Walter of Mr. Keane was extremely good during the amorous scene with Emily, who seemed to enjoy it, in fact the acting of the pair at this stage allowed the merriment to continue even throughout Mr. Whatmuff's absence.

Even in the light of a star of the first magnitude like Mr. Stenhouse the remaining members of the cast shone brilliantly, and we were therefore not at all surprised at the very imperative call at the fall of the curtain.

The visitors afterwards enjoyed the hospitality of Mrs. McClellan and the Principal.

The success of the plays was greatly increased by reason of the care taken by Prof. Paton and the stage carpenters in the arrangement and decoration of the stage.

CHLORINE IN RAIN WATER.

The rainfall for the six months ending September 30 was 9·47 inches, it fell on 73 days, and contained chlorides equivalent to ·2784 grains of sodium chloride per gallon, or 8·52 lbs. of common salt per acre. The total rainfall for twelve months to the same date was 27·79 inches on 151 days, and the total deposit of chlorides equal to 31·19 lbs. of common salt per acre. E. K.

At a late meeting of the Chemical Society a paper was read by Professor Edward Kinch on "The amount of Chlorine in Rain Water collected at Cirencester." The author has already published the results (Transactions of the Chemical Society, 1887, 51, 92) of the estimation of the chlorine in the water collected in the rain gauge at the Royal Agricultural College, 443 feet above sea level, and about 35 miles distant from the sea, up to 1886. The results of his determinations up to the present time are summarised below. The rain water for periods of six months, namely, summer months, April to September, and winter months, October to March, inclusive, gave the following averages :

Periods.	Rainfall in inches.	Chlorine per million.	Equivalent to NaCl, grains per gallon.	Equivalent to NaCl, lbs. per acre.
Mean of 14 winter periods to March 31st, 1900	14·26	3·55	0·412	19·35
Mean of 14 summer periods to September 30th, 1900 ...	12·78	2·27	0·261	10·40
Average of 14 years to September 30th, 1900	27·04	2·91	0·337	29·75
Mean of 26 winter periods to March 31st, 1900	15·83	3·76	0·435	21·29
Mean of 26 summer periods to September 30th, 1900 ...	14·78	2·58	0·302	14·81
Average of 26 years to September 30th, 1900	30·61	3·17	0·369	36·10

OLD STUDENTS.

Mr. Frank R. Harding-Newman, M.R.A.C., Kirtling Estate Office, has been appointed Agent to the Right Hon. Lord North, Kirtling, Newmarket, also to Mrs. Montagu Sharp, Chippenham Park, Soham, and to Mrs. Harding-Newman, Clacton.

Mr. G. H. Nevile, M.R.A.C. (Gold Medallist, December, 1898), who has been assisting H.E. Nubar Pasha in agricultural experimental work and in developing his estates in Egypt, has been offered by Lord Cromer a Soudanese Civilianship, and has accepted the post.

Mr. William Ryder Richardson, M.R.A.C. (1886), has been appointed Secretary to the St. George's Golf Club, Sandwich.

The late Mr. A. D. Faber, M.R.A.C., 1886, formerly editor of the *Gazette*, whose lamented death at Vancouver City, of typhoid, last year, we have already recorded, left a widow and three children. His estate, which is about nine miles from Alberni, British Columbia, and comprises

1,570 acres, is to let or for sale in whole or in part. There is a large house and commodious farm premises beautifully situated close to Sproat Lake, with a large garden and orchard, made by Mr. Faber since 1889. About 10 acres of land is thoroughly cleared and arable, and about 25 acres more is almost clear. There is excellent hunting with bear and deer on the estate and good grouse shooting, also fishing in the lake and in Somas River. It is almost certain that a large saw mill, followed by logging camps, will be established on the lake next year, and great activity is being shown in the mining of the district of Alberni and the Sproat Lake. This ranch is specially adapted for raising cattle for the market. Mr. Faber had for some years given all his time to developing the estate, and the present is an exceptionally good chance for one intending to settle in British Columbia. Pemberton and Son, 45, Fort Street, Victoria, B.C., are the agents.

Mr. H. C. Waterfield, M.R.A.C. (1896), has been appointed sub-agent on Lord Iveagh's Burhill Estate, Surrey, and resides at Cobham, Surrey.

Mr. C. E. O. Wilkinson, M.R.A.C. (Gold Medallist 1882), has been appointed agent to Lord Monteagle's Irish estate, Foynes, Limerick.

OBITUARY.

The Rev. W. Meredith Lane, M.A., Cantab., Professor of Mathematics and Natural Philosophy at the R.A.C. 1863 to 1865, and Rector of Beeford, East Riding, Yorkshire, from 1888, died on November 4th in Canary Islands, where he had gone for the benefit of his health. He was formerly Scholar of Trinity College, Cambridge, and graduated as a Wrangler in 1861.

COLLEGE NOTES.

On Monday, December 3rd, Professor E. Blundell gave a lecture to a largely attended meeting of the Cirencester Chamber of Agriculture on "The Feeding of Farm Animals." He gave illustrations from cattle fed at the R.A.C., and strongly advocated the feeding of more pigs on the farm, using for the purpose English grown barley when the price is low. An interesting discussion followed.

Billiards.—An American Tournament Handicap, 200 up, was played off during the term between twenty competitors. The prizes went to 1, Gawthropp; 2, Burrell; 3, Wason. The top scores were Gawthropp, lost 3; Burrell and Professor Paton, 4; Aspinall and Wason, 5; Professor West, 6; Irwin, 7; Hancock, Hazledine, Professor Locke, and Salvago, 9 each. Professor Paton and Aspinall being on the Billiard Committee did not compete for the prizes.

Scientific Plant Breeding.—On Friday, November 23rd, Mr. T. R. Garton, a member of the firm of Gartons, Limited, of Warrington and Newton-le-Willows, delivered a special lecture on the methods of and the results obtained by the important work with which their name is identified in the improvement by means of cross-fertilization of cereals and other farm plants. The lecture was illustrated by excellent lantern slides from photographs—in many cases highly magnified—showing the principles and processes connected with the work. Mr. W. Griffiths efficiently acted as lanternist. The Principal, in briefly introducing the lecturer, referred to the importance of the work to which Messrs. Garton had devoted themselves during the last twenty years, and added that they had very kindly invited the students to pay a visit to their experimental grounds. Professor Blundell, in moving a vote of thanks to Mr. Garton, asked several questions (to which that gentleman afterwards replied), and Professor West, in seconding the vote of thanks, took occasion to criticise the somewhat loose use of the term "cross-fertilization," which in botanical language meant the carrying of the pollen of one flower to the stigma of another flower of the same variety. The crossing of different varieties, whether of wheat or any other plant, was hybridization, and not cross-fertilization. The misuse of the terms sometimes led to misunderstanding.

FARM NOTES.

PRIZES TAKEN AT THE VARIOUS AGRICULTURAL SHOWS, 1900, BY MR. SWANWICK'S STOCK.

Royal Agricultural Society's Show at York: Cotswold Sheep—1st for shearling ram, 2nd for three ram lambs, 2nd for three ewe lambs.

Bath and West of England Show at Bath: Berkshire Pigs—1st and championship for old boar, 3rd for two young boars; Cotswold Sheep—1st for shearling ram, 2nd for three ram lambs.

Royal Counties' Show at Winchester: Berkshire Pigs—1st and championship for old boar, best in his class, 1st for young boar.

Oxfordshire Show at Oxford: Berkshire Pigs—1st and championship for old boar, best in his class, 1st for young boar; Cotswold Sheep—1st and 2nd for shearling ram, 1st for ram lambs, 1st for ewe lambs.

Gloucestershire Show at Gloucester: Cotswold Sheep—1st and 2nd for shearling ram, 1st for ram lambs, and 1st for ewe lambs.

During the past term two Oxford Down Ewes, from Mr. James Hobbs, Maiseyhampton, have been added to our flock. The balance of the lambs have been sold, making a total of 25 lambs, realising £40 7s. 9d.

Three heifers and one steer, bred at the College, have been put up to fatten. Two are having linseed cake and maize meal, and two decorticated cotton cake and maize meal. The experiment will be continued until towards the end of the spring term.

The Ploughing Match came off in No. 11, when Bateman and Lindsell were bracketed for the prize, Walford being placed next. There were nine entries, the whole of the work being considered to be beyond the average in quality.

A Turnip Cleaning and Pitting Competition was a new feature in practical work on the farm. Nine portions of twelve perches each were marked out. The estimated yield of roots was put at 26 tons per acre. The swedes had to be cleaned, stacked, covered with straw, and earthed up. With few exceptions, the whole of the work was finished, Hemelryk taking first prize, Bateman second, Burrell and Keane being highly commended.

In the Butter Making Competition Ashton Smith obtained the prize, Stenhouse, Hervey, and Chastenet all making very good butter.

The Milking Competition resulted in Hemelryk gaining the prize, while Whitehead, Olivera, Farwell, and Wilson made very good time, and milked clean.

Owing to the unfavourable weather the two acres of Gartons' and black Tartarian oats grown in No. 11 under experimental treatment have not been threshed. It is hoped that a full report of these will be given in our next issue.

STEEPLECHASE.

The annual Steeplechase took place on the College Farm on Wednesday, December 5th, in very unfavourable weather. The course was about two miles. H. B. Beddall and A. Wallis-Wilson led most of the way, the latter, however, met with an accident in the jump out of No. 8, and Beddall won easily. A splendid race for second place resulted in E. Walford just beating R. Hartley. There were eleven entries and eight starters. Result :—1, H. B. Beddall ; 2, E. Walford. Time, 14 minutes 41 seconds.

GOLF.

An incident which occurred this term in the College Farm links is worthy of record. Professor G. T. Locke, whilst playing with Mr. A. Gawthropp on October 25th, drove a new ball from the seventh tee which lit in view of the tee across the valley. As the players were proceeding towards the ball, a passing rook was seen to alight and take the ball in his beak and fly off to an adjacent field. Here he probably discovered that stolen objects are not always palatable.

The course was in good order the first part of this term, but owing to the wet weather the greens became rather sticky towards the end. Mr. Swanwick has, however, kindly arranged for his bailiff, Mr. Goodworth, to have a mixture of diffent artificial manures put on the greens, and it is hoped this will improve them.

The Junior and Senior Cups were played for on Friday, November 30th. Mr. Patten took the Senior Cup with a very good score of 94—15=79. Mr. Fowler won the Junior, returning 101—18=83. The following returns were made :—

SENIOR.	Hcp.	
Patten	15	79
Prof. Paton	scr.	87
Mr. Haygarth	scr.	92
Darling	16	92
Sawyer	8	94
Prof. Locke	15	94
Gawthropp	12	94
Prof. Blundell	6	96
Mr. Swanwick	12	106

JUNIOR.	Hcp.	
Fowler	18	83
Sandford	18	104
Prof. Wooldridge	20	113
Prof. West	25	115
Irwin	18	125

The following played but did not make any return, Hartley, 25 ; Pennington, 25 ; Rowe, 25 ; Hervey, 20 ; Wallis-Wilson, 20.

CRICKET.

(Concluded from Page 33.)

R.A.C. v. GLOUCESTER CITY.—Played at the R.A.C. on July 25th, resulting in a decisive win for the visitors. The College losing the toss, Gloucester batted first. The first six wickets falling for under 100, the College looked like winning, but our opponents managed to put together 222 before being dismissed. The College started badly and only managed to place 52 runs to their credit. Score :—

GLOUCESTER.	
F. Tandy, l-b-w, b Darling	23
W. Roberts, b Harben	4
H. R. Ford, c Goodbody, b Bell	14
J. R. Jackson, not out	99
H. J. Boughton, c Gunter, b Darling	1
H. W. Arkell, b Goodbody	13
E. T. Huggins, b Goodbody	1
F. W. Fox, st Walford, b Bell	33
E. James, b Bell	0
Hacker, b Fosbery	18
Bewick, c Walford, b Harben	2
Extras	14
Total	222

R.A.C.	
H. E. Atkinson, b Hacker	5
E. Walford, b Hacker	5
F. A. Goodbody, b Bewick	10
B. S. Cave, b Hacker	2
W. F. Fosbery, c and b Jackson	8
V. D. Stenhouse, b Hacker	0
G. G. Gunter, b Bewick	0
L. J. Darling, c James, b Jackson	10
G. P. Harben, b Hacker	1
D. G. Hervey, b Hacker	4
J. C. Bell, not out	2
Extras	5
Total	52

R.A.C. v. CIRENCESTER TOWN.—Played on July 28th, on the College ground. The College winning the toss batted first, but only managed to put 85 runs together. The Town started badly, 3 wickets falling for 20 runs, but they had compiled the total of 169 before the close of their innings. Score :—

R.A.C.	
H. E. Atkinson, b Giles	1
W. F. Fosbery, c and b Giles	0
F. A. Goodbody, b Legg	12
E. Walford, c and b Giles	5
B. S. Cave, b Legg	4
G. G. Gunter, b Giles	13
V. D. Stenhouse, c Allen, b Giles	10
L. J. Darling, b Giles	16
G. P. Harben, b Legg	1

CIRENCESTER.	
S. Boulton, c Gunter, b Darling	6
A. Prout, c Atkinson, b Darling	4
T. H. Fowler, b Darling	1
C. Allen, c Bell, b Gunter	32
W. G. Legg, l-b-w, b Bell	60
R. W. Ellett, c Gunter, b Darling	41
W. May, c Cave, b Bell	2
E. C. T. Dodd, b Bell	6
H. Rawlins, c Harben, b Darling	0

D. G. Hervey, b Giles	19	J. H. Compton, b Bell	4
J. C. Bell, not out	0	Giles, not out	0
Extras	4	Extras	13
Total	85	Total	169

BATTING AVERAGES.

	Total Runs made.	No. of Innings.	Times not out.	Highest Score.	Average.
†G. G. Gunter	292	18	0	58	16·4
H. E. Atkinson	162	11	0	64	15·7
F. A Goodbody	253	18	0	47	14·1
L. J. Darling	156	15	1	40	11·1
D. G. Hervey	152	16	1	42	10·2
B. S. Cave	82	9	1	34	10·2
W. F. Fosbery	150	15	0	33	10·0
V. D. Stenhouse	141	15	0	55	9·6
G. P. Harben	127	15	0	36	8·7
E. Walford	159	18	0	43	8·5
J. C. Bell	34	9	5	19*	8·2

† Average Bat. * Not out.

Thanks are due to Messrs. Lindsell, Burrell, Beddall, and Smith, who have helped on various occasions.

BOWLING ANALYSIS.

	Overs.	Maidens.	Runs.	Wickets.	Average.
*J. C. Bell	52	6	207	17	12·2
B. S. Cave	98·5	9	357	21	12·5
L. J. Darling	112	8	494	23	21·5
F. A. Goodbody	150	14	574	25	24·9
G. P. Harben	97	9	360	14	26·1
G. G. Gunter	93	7	309	11	28·1

* Average Ball.

Thanks are due to Messrs. Stenhouse and Fosbery, who have bowled occasionally.

FOOTBALL.

RUGBY.

At the commencement of this season the prospects of the Rugby team looked very black, and, indeed, at one time the question arose as to whether it was worth while carrying on the game for the time being. But after a few matches matters brightened somewhat, and the team eventually acquitted itself very creditably on more than one occasion. We can look back with satisfaction on several of the matches, especially those against Cheltenham College and the Berkshire Wanderers, it being many years since the R.A.C. scored as much as ten points against the foregoing team. The team was greatly handicapped for want of practice, which has been absolutely unobtainable, as never more than nineteen men were able or willing to play. Unfortunately at the end of this session the Rugby team loses the services of J. F. Bell, who has played regularly for three years in all the College matches. His loss will be a severe blow, but we can always hope for a large entry of fresh members who will play and take an interest in the Rugby game.

CHARACTERS OF THE TEAM.

*J. F. Bell.—A brilliant half-back. Has been the mainstay of the team.

*E. M. Wason.—A very useful forward, plays a hard game, and works well in the scrum.

*H. A. V. Bonnin.—Has unfortunately been hurt several times. Is very fast, and plays well when sound.

*E. Walford.—A good centre three-quarter. Intercepts well, but is inclined to try it too often.

*S. Hancock.—A very fast wing three-quarter. Tackles splendidly. Should learn to pass sooner.

*T. Crewdson.—A thoroughly good forward. Knows the game, and plays it well.

*R. H. Keane.—A heavy forward. Useful out of touch. Kicks well.

*H. B. Beddall.—A very strong and hard-working forward, particularly good out of touch. Has done his best to keep the scrum together. A good place kick. Has made a very efficient captain.

*A. Gawthropp.—A hard-working forward. Has learnt the game quickly.

*R. C. Barton.—A light half-back. Has done well considering the short time he has played there.

*G. A. Lambert.—A useful forward. Works hard, and uses his feet well.

*E. Wilson.—A light forward. Very good in the loose. Not fond of the scrum.

*G. J. Wilson.—Centre three-quarter. Takes his passes well. A good kick.

H. Pennington.—A useful forward in the open, but persistently shirks the scrum.

F. Whitehead.—A weak full back. Fields well.

G. S. Bisdee.—Has played several times. Should be good with practice.

P. J. Lindsell.—Also played a few times. Improved since last year, but must learn to play a harder game.

* Have received their colours.

Thanks are due to B. F. Blois, D. G. Hervey, and G. T. Locke for their assistance in several matches. Also to S. Burrell for acting as linesman in every match.

R.A.C. v. Marlborough College.—This match was played at Marlborough on October 13th, and resulted in an easy win for the School by 37 points to *nil.* Being the first match of the season the result was almost a foregone conclusion, several players turning out for the first time this year, and one or two for the first time to Rugby football. Team :—F. Whitehead, back ; H. A. Bonnin, B. Blois, E. Walford, and D. Hervey, three-quarters ; J. F. Bell and G. Wilson, halves ; H. B. Beddall, R. H. Keane, E. Wilson, P. J. Lindsell, R. C. Barton, S. Hancock, G. Bisdee, and J. Bateman, forwards.

R.A.C. v. Stroud.—Played on the College ground on October 20th, and resulted in a win for Stroud by 22 points to *nil.* It was the first time for several years that the College had played Stroud first team ; on the last occasion Stroud won by over 40 points. The College team showed much improved form, and played a good hard game against a much superior team, both in weight and knowledge of the game. For the College, J. F. Bell played well at half ; G. Wilson played a hard game forward and was well backed up by Wason and Gawthropp. Team :—F. Whitehead, back ; H. A. Bonnin, E. Walford, B. Blois, and S. Hancock, three-quarters ; J. F. Bell (captain) and G. T. Locke, halves ; E. M. Wason, R. H. Keane, G. Wilson, E. Wilson, P. J. Lindsell, Lambert, G. Bisdee, and R. C. Barton, forwards. Beddall was away playing at Gloucester.

R.A.C. v. St. Paul's Training College.—Played on the home ground on October 24th. This was, perhaps, one of the best games of the session, and the College experienced hard luck in losing by 11 points to *nil.* The home side kicked off, and during the first half play was mostly in the home 25, and several times the College were obliged to touch down in self defence. Locke was conspicuous for some good kicks, and Bell was very safe. The first try was lost through bad "marking" out of touch, their right centre three-quarter taking from the throw out, and running in scored at a bad angle. Shortly after this their full back caught well from a high kick and ran in, scoring almost under the posts. The kick failed. After half-time the play was very equal, Hancock doing some good tackling and Walford saving well on several occasions. The forwards played hard, but were beaten by a heavier pack. Team :—Whitehead, back ; Bonnin, Walford, Blois, and Hancock, three-quarters ; Bell and Locke, halves ; Beddall, Keane, G. Wilson, E. Wilson, Bisdee, Lambert, Pennington, and Gawthropp, forwards.

R.A.C. v. CHELTENHAM COLLEGE.—Played at Cheltenham on November 3rd. Although beaten by 26 points to 10 points, the College played a very good game, it being over twelve years since the R.A.C. scored so much against the School. In the first half the School scored 13 points and the College 5 points, Crewdson, who was playing for the first time, scoring the try. Bonnin played well, and on two occasions had hard luck in not scoring. In the second half the School scored three more times and the College once, Walford this time getting over, and Beddall, as before, converting. Bell was conspicuous as usual, and Hancock tackled well, saving several certain tries, bringing his man down in fine style. Of the forwards, Crewdson and Keane played hard, and were well supported by Wason and Gawthropp. Team :—Barton, back ; Bonnin, Walford, G. Wilson, and Hancock, three-quarters ; Bell and Locke, halves ; Beddall, Keane, Crewdson, Wason, Gawthropp, Pennington, Lambert, and E. Wilson, forwards.

R.A.C. v. CHELTENHAM A.—Played on the College ground on November 10th, the College losing by 1 point, the score being 2 tries to 1 goal. Unfortunately Crewdson was unable to play in this match, Lindsell filling his place. The game was of a somewhat scrambling nature, the chief feature of the first half being a nice bout of passing between Bell, Walford, and Bonnin, which resulted in the latter scoring behind the posts. The try was converted, and at half-time the College were leading by a goal to *nil*. In the second half the College forwards went to pieces, and Cheltenham scored two tries in quick succession, thus obtaining a lead of one point. No further scoring took place. Team :—Whitehead, back ; Bonnin, Walford, G. Wilson, and Hancock, three-quarters ; J. F. Bell and Locke, halves ; Beddall, Keane, Wason, Gawthropp, E. Wilson, Bisdee, Lambert, and Lindsell, forwards.

R.A.C. v. STROUD ROVERS.—Played on the College ground on November 17th, and resulted in a win for the College by 8 points to 3. The College started against the wind, and play was for the most part in the home 25 during the first half. The Rovers scored a lucky try, which was entirely due to the wind. In the second half, helped by the wind the College played up better, and Wason and Hancock scored, the first try being converted. The forwards played a good game, Crewdson, Gawthropp, and E. Wilson being very prominent. Of the outsides, Bell played hard, and R. C. Barton, playing for the first time at half, was a great success. Team :—Whitehead, back ; Bonnin, Walford, Wilson, Hancock, three-quarters ; Bell and Barton, halves ; Beddall, Crewdson, Wason, Gawthropp, Keane, G. Wilson, Lambert, and Pennington, forwards.

R.A.C. v. BERKSHIRE WANDERERS "A" TEAM.—The Wanderers brought a very strong team to the College on November 21st, and the result of the game reflects more credit on the College team than the win a week before. Losing the toss, the College kicked off up hill, and in the first half pressed the Wanderers hard but could not manage to score. Hancock put in several good runs, and once nearly got over. No score resulted at half-time. In the second half the Wanderers scored three times, owing to the excellence of their two centres, G. Romans and Clutterbuck, both Gloucestershire County men. Keane played well for the College, Crewdson and Wason also doing good work. Result was 11 points to *nil*. Team :—Whitehead, back ; Bonnin, Walford, Wilson, Hancock, three-quarters ; J. F. Bell and Barton, halves ; Beddall, Wason, Crewdson, Keane, Gawthropp, Pennington, Lambert, and E. Wilson, forwards. Bisdee, Burrell, and Lindsell, substitutes for the Wanderers.

R.A.C. v. MAGDALEN COLLEGE, OXFORD.—Played on the College ground on Nov. 24, resulting in a win for Magdalen by 17 points to *nil*. The College were without Crewdson, which was a great loss to the pack. The game was very fast and open. The Magdalen forwards were a heavy set, and never gave the College men a chance in the scrum. Outside Luce was a host in himself, running through the College centres almost every time he handled the ball. He also dropped a goal. The College forwards stuck to their work, but were hopelessly beaten. G. Wilson played well at three-quarters. Hancock as usual tackled well. Team :—Whitehead, back ; Bonnin, Walford, G. Wilson, and Hancock, three-quarters ; Bell and Barton, halves ; Beddall, Wason, Keane, Gawthropp, E. Wilson, Lambert, Lindsell, and Pennington, forwards.

R.A.C. v. STROUD.—This match was played at Stroud on Saturday, December 1st, and the result was an easy win for Stroud by 28 points to *nil*. The College were outplayed in all parts of the field. The Stroud three-quarter line was very strong, and their passing almost without fault. The College forwards played hard, and stuck to the game well ; Crewdson was especially good. The outsides were somewhat weakened by the loss of Bonnin, and Hancock was off colour owing to an injury to his knee. Bell played a good game, and G. J. Wilson put in some useful runs. The scoring was evenly divided over the entire game, and if Stroud had possessed a man who could kick, the score would have been much higher. Team :—Whitehead, back ; Blois, G. J. Wilson, Walford, and Hancock, three-quarters ; Bell and Barton, halves ; Beddall, Wason, Crewdson, Gawthropp, Keane, Lambert, E. Wilson, and Pennington, forwards.

The Football Kicking Competitions came off on Wednesday, December 13th, and were well contested. The prizes were won by J. F. Bell for the Drop Kick, R. H. Keane for Place Kicking, and M. F. Irwin for Punting.

ASSOCIATION.

CHARACTERS OF THE XI.

S. M. SAWYER.—On his day has proved very useful in goal, having saved many good shots, but is apt to be nervous and very slow at times in getting the ball away.

T. H. FOWLER.—Quite the mainstay of the defence, a sure and powerful kick, and fine tackler.

PROFESSOR WOOLDRIDGE.—Has improved greatly since the beginning of the term, occasionally misses his kick, but useful in saving a rush, and uses his head well.

J. F. BELL.—A very useful half, and sticks well to his man.

A. GAWTHROPP.—A slow but hard-working half. Must learn to feed his forwards better.

A. WALLIS-WILSON.—Has a good knowledge of the game, passes well to his forwards, but should learn to get the ball away quicker.

H. A. V. BONNIN.—A useful outside with plenty of pace.

B. F. BLOIS.—Has done most of the scoring for the team, being, as centre forward, fast, a good shot, and quick in passing. Has lately been found more valuable as centre half.

L. J. DARLING.—Plays a hard game, but does not combine quite enough with his forwards. Has captained the team well on occasions.

E. WALFORD.—Has come on a lot lately, works hard and uses his weight, but a poor shot.

D. G. HERVEY, Captain.—A good centre forward with plenty of pace, but unfortunate in not scoring more often. A keen captain.

W. J. Wright and W. Fosbery have rendered excellent services when they have been able to play, but unfortunately have both been injured, Wright being a hard-working, tricky inside left, and Fosbery very safe in goal.

Mr. E. M. Beecham has most kindly officiated as referee in all our home matches, a kindness which has been thoroughly appreciated.

R.A.C. v. SWINDON AMATEURS.—On October 17th we were at home for our opening match to this Club, who brought down a useful team, though not quite their best side. Blois early in the game getting well away opened the scoring for the College by a good shot, but soon afterwards the visitors got level, making the half-time score 1 all. In the second half Fosbery in goal very smartly saved a hard shot, and the College working up in turn to the Amateurs' goal nearly scored through Hervey, but unfortunately their goal-keeper was equal to the occasion, and no further scoring on either side took place. A very even game thus ended in a draw of 1 goal all. Blois and Darling were the pick of our forwards, while Fowler at back played a magnificent game, and Fosbery was very safe in goal. Team: Fosbery; Fowler, Beddall; Wallis-Wilson, Wooldridge, Gawthropp; Bonnin, Hervey, Blois, Wright, and Darling.

R.A.C. v. DEAN CLOSE SCHOOL.—On October 24th the College easily beat Dean Close on our own ground, Blois at centre forward doing almost what he liked, while Fowler at back was almost invariably too good for what were, with the exception of the outside left, a weak lot of forwards. Result:—R.A.C., 7; Dean Close School, 2.

R.A.C. v. WYCLIFFE COLLEGE.—On Wednesday, October 31st, we had our first match with Wycliffe away, and starting off well, Wright scored first for the College with a nailing shot. Blois, soon after getting away, added our second goal, making half-time score 2—1. Re-opening, Salvago scored by a good shot from the wing, but the School, who had had bad luck in not having scored before, now added their only goal. About ten minutes before time Fowler added another goal for us by one of his famous long-distance shots. The team was ably captained by Darling, who was well backed up by Blois and Fowler. Team: Sawyer; Fowler, Wooldridge; Bell, Gawthropp, Wallis-Wilson; Walford, Darling, Blois, Wright, and Salvago.

R.A.C. v. CIRENCESTER TOWN.—This, our opening match with the Town, was played at home on November 8th. A blinding rain and a high wind marred all the pleasure of the game for the players. The Principal, however, bravely facing the elements, kicked off for the College amid applause. Claud Fowler opened the scoring for the Town, Fosbery unluckily taking the ball just over the goal line. The Town, again pressing, scored another goal, Arnold centering and Crabb scoring, after Tranter had hit the bar with a good shot. After this, the College forwards setting to work, Blois and Hervey in turn both got clean away, but finished up their efforts by shooting wide of the mark when well in front of their opponents' goal. In the second half the pressing was very equal, and near the end Bonnin scored by a long, well-judged shot, leaving us the losers by 2 goals to 1. Team: Fosbery; Fowler, Wooldridge; Bell, Gawthropp, Wallis-Wilson; Bonnin, Hervey, Blois, Darling, and Walford.

R.A.C. v. DOWNTON COLLEGE.—Played at Chippenham on November 21st. The College had a weak team, being without Bonnin, Wright, and Walford. Winning the toss, we started off down the hill, and Blois soon scored for the College, and soon after Darling added another from a good pass by Blois. Downton, however, getting away before half time made the score at the interval 2 goals to 1. In the second half no scoring took place; both sides were unlucky, however, as more than once the ball was on each goal-line, and so the final result left us victors by 2 goals to 1. The backs were the pick of the College team, well aided by Sawyer. The forwards gave a very poor exhibition of shooting, as they bombarded the Downton goal almost the whole of the first half, and only scored twice. Team: Sawyer; Fowler, Farwell; Wallis-Wilson, Gawthropp, Wooldridge; Salvago, Hervey, Blois, Darling, and Blaauw.

R.A.C. v. RADLEY COLLEGE.—Played at Radley on November 28th. Winning the toss, we started down-hill in our favour, but in spite of this Radley quickly scored two goals, the first one being badly taken by Sawyer, while in the next place a miss-kick by Wooldridge proved disastrous. The College then started to press, and Darling and Blois put in good shots, which were both saved. Before half-time two more goals were added against us, one a penalty from hands inside the circle. In the second half, Blois changing to centre half, the game was very even, our forwards putting in a lot of good work, but the school goal-keeper was a bit too good for them, and our opponents totted up one more goal against us. Leaving the excellence of the school goal-keeper, the good passing of their forwards was mainly the cause of our downfall, though we should not have been beaten by as much as we were. For the College, Blois at centre half was very good, and Walford played an excellent forward game. Team: Sawyer; Fowler, Wooldridge; Bell, Gawthropp, Farwell; Salvago, Hervey, Blois, Darling, and Walford.

R.A.C. v. Cirencester Town.—In this our return match with the Town in the Park on November 29th the elements were again unpropitious, rain having made the ground very sticky. In spite of the bad weather, however, Miss Grace Lane, the leading lady in the Cricket Club Theatricals, turned out to kick off for the College. For the first half the play was very even, though the Town playing down-hill were once or twice dangerously near our goal. The half-time whistle, however, blew without scoring on either side. On re-opening, the College pressed vigorously, and a good pass by Walford right in front of goal resulted in Hervey, who was unmarked, opening the score for the College. An unfortunate accident to Blaauw three minutes before time left the College one man short. Fortune was certainly not on our side on this occasion, as about a minute before time and in semi-darkness Arnold equalised for the Town, after a slight scrum in front of our goal, and so the game ended in a draw of 1 goal all. Blois at centre half worked very hard for his side, while Fowler at back and Sawyer in goal were in their best form. Team: Sawyer; Fowler, Wooldridge; Gawthropp, Blois, Bell; Salvago, Walford, Hervey, Darling, and Blaauw.

R.A.C. v. Cheltenham Town.—Played on our ground on December 8th. The first half was very even, no scoring taking place, but soon after re-starting Moore got the first goal for Cheltenham Town by a high shot, and near the end Vickerstaffe scored again for them, Sawyer failing to clear the ball from a very simple shot. The College forwards played with little go, and the passing was bad, Wright perhaps being the best. Blois at centre half was in grand form, and the backs also played a very useful game. Result:—Cheltenham Town, 2; R.A.C., 0. Team: Sawyer; Fowler, Wooldridge; Wallis-Wilson, Blois, Gawthropp; Salvago, Wright, Hervey, Walford, and Darling.

REVIEWS.

Woburn Experimental Fruit Farm. Second Report. By the Duke of Bedford and S. U. Pickering, F.R.S. London: Eyre and Spottiswoode. pp. v. 259. 5s.

The series of interesting and important investigations into problems connected with fruit farming now being carried on at Woburn Fruit Farm were started but five years ago, the first report was issued three years ago, and, considering the nature of the work, the interval is not long. Most of the results obtained so far, are, as the authors point out, still to be regarded as preliminary, and some are too incomplete for present publication. Some of the results are of a negative character, but such results often have a practical utility little inferior to positive results. For instance, many endeavours have been made to destroy that destructive pest the black currant mite, so far without success; even hydrocyanic acid has not proved effectual. Although some cure would be welcomed rather than the drastic process of removing and destroying all affected bushes, yet with present knowledge by this means only can the pest be eradicated. The fact that growing grass round a young tree is extremely prejudicial to its growth and health is still more strongly emphasised than in the first report. The effect of grass growing over the roots of older trees is much less and probably very small. The manuring of young apple trees in this soil appears to have little effect, and the manures are apparently largely wasted; this no doubt is the case on many soils. There has been a tendency in the past to overfeed young trees and to starve older ones which have exhausted the ground near them. The results of strawberry culture occupy a good many pages, eighty-five varieties being grown for five years in the chief set of experiments; the varieties are arranged in "orders of merit" according to seven different properties, viz., weight of crop, deterioration in cropping power, uniformity of crop, size of berry, deterioration in berry, uniformity of size of berry, and excellence in flavour and character. No doubt the position of a given variety in any order of merit will depend largely on its suitability to the soil and climate in which it is grown, but the results here obtained, from very carefully conducted experiments, will have much value to the strawberry grower. Manurial experiments with strawberries and with bush fruits are, at present, inconclusive. Experiments on different methods of treatment applied to apple trees are of increasing value. There are also recorded observations on a disease of plum trees previously observed in a plantation at Harpenden; on the effect of planting potatoes at different times, and in sets of different sizes; also meteorological observations. The value of the work being carried on at the Woburn Fruit Farm, through the liberality and zeal of the Duke of Bedford, and with the able scientific co-operation of Mr. Pickering and his assistants, is even now very great. With increasing years it will become more and more valuable as it reveals or proves the fundamental principles on which successful fruit culture depends, now too much obscured by pure empiricism. All sound and advancing fruit growers will welcome this report and give it careful attention.

THE YEARBOOK OF THE UNITED STATES DEPARTMENT OF AGRICULTURE. 1899. Washington, 1900. pp. 880.

This yearbook is in some respects an advance even on its predecessors; it was desired that the yearbook which would be distributed in the last year of the century and during the Paris Exhibition should contain a *résumé* of the achievements in the United States in every branch of science related to agriculture during the century. In addition to the half million copies annually printed an extra edition of 20,000 was provided for foreign distribution during the time of the Paris Exhibition. There are twenty-six papers on the progress of the different departments of the science and practice of agriculture, all written by experts, most of whom have devoted their lives to the particular subject. All are excellent, and it is almost invidious to pick out any for special mention, but those by A. C. True and H. W. Wiley deserve special commendation for their thoroughness and utility to other nations. Mr. True has written an article on Agricultural Education in the United States, and another on Agricultural Experiment Stations in the United States. Mr. Wiley contributes an article on the Relation of Chemistry to the Progress of Agriculture. Soil Investigations is by Milton Whitney, Dairy Development by H. E. Alvord, Road Building by M. O. Eldridge, Treatment of Plant Diseases by B. T. Galloway, Economic Entomology by L. O. Howard, Knowledge concerning Animal Diseases by D. E. Salmon, and there are others equally valuable. There are about 200 pages of appendix of useful matter, 83 full-page plate illustrations besides other figures in the text. The contributors and the editors are to be congratulated on the success of their efforts to produce a yearbook of extra value and interest, and the thanks of the agricultural community of the whole world are due to the Government at Washington for printing and distributing it in such numbers.

MARYLAND AGRICULTURAL EXPERIMENT STATION. THE THIRTEENTH ANNUAL REPORT, 1899-1900. College Park, Maryland. pp. x. 161.

This consists mainly of five bulletins, viz., on experiments in feeding pigs for the production of pork ; a study of the cause of mottled butter ; on Insecticides, Fungicides, and Spraying Apparatus ; on Lime, its sources and relation to Agriculture ; and on the Culture and Handling of Tobacco. Some of these, especially that on Insecticides and Fungicides, and their application, will be useful over a much wider area than the State itself.

THE CULTURE OF FLOWERS FROM SEEDS AND BULBS. By E. K. Toogood. Southampton : Toogood & Sons. pp. 190. 10d.

This excellent little handbook and calendar for the flower garden has reached its tenth thousand. Its information is very compact, complete, and practical, and full of use to both professional and amateur gardener.

TREATISE ON LAWNS, CRICKET GROUNDS, &c. By E. K. Toogood. Southampton : Toogood & Sons. pp. 19. 2d.

Contains concise and useful remarks on the preparatory treatment of the soil, the lawn plants, sowing lawn seeds, turfing and the after care of lawns. We are glad to see the importance of manuring poor lawns alluded to.

WEST OF SCOTLAND AGRICULTURAL COLLEGE. REPORTS ON EXPERIMENTS ON THE MANURING OF POTATOES IN 1899 ; by P. Patrick Wright : and, ON THE INFLUENCE OF MANURES IN THE QUALITY OF POTATOES ; by J. W. Paterson.

These experiments on potatoes were carried out on seventeen farms in the counties of Ayr, Dunbarton, Haddington, and Perth. Two varieties of potatoes, Maincrop and Up-to-Date, the latter variety gave the better return for manure applied. The most profitable return for manuring was with a moderate dressing of farmyard manure supplemented with suitable artificials. Potatoes grown on farmyard manure alone were deteriorated in nutritive value and in cooking quality ; and with a half-dressing of farmyard manure they were better in quality than with a full dressing. The best potatoes in nutritive value and in cooking quality were grown on artificial manures alone ; but these suffered more readily from drought on light soils than when farmyard manure was also given. The safest and best method of manuring the potato crop is to use both farmyard manure and artificials. For supplying potash, 1½ cwt. of sulphate of potash was found most efficacious, and gave better results on the quality than kainite. Nitrate of soda put on as a top dressing, at the rate of 1 cwt. per acre, immediately after the first weeding of the crop, exercised no deleterious influence on the quality of the potatoes, and increased the yield. Ten tons farmyard manure, 4 cwt. superphosphate, 1 cwt. sulphate of ammonia, and 1½ cwt. sulphate of potash seems the best manuring both as to quantity and quality. The experiments will be specially valuable to the district in which they were made.

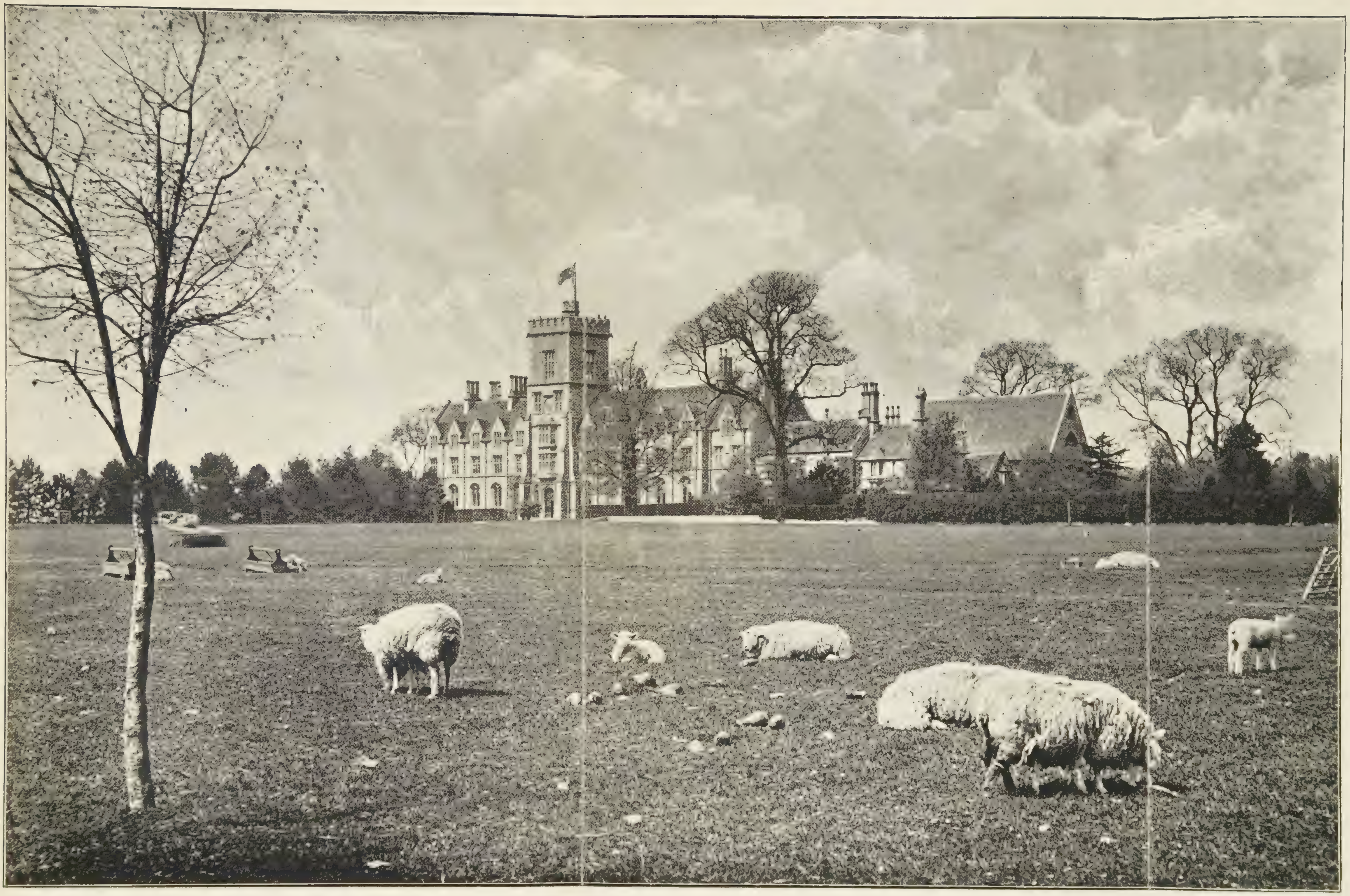
SHOULD I SUCCEED IN SOUTH AFRICA ? By a Successful Colonist (F. Darrell). London : Simpkin, Marshall, Hamilton, Kent & Co. 1900. 8vo. pp. 116. Price 1s.

This book may well be recommended to anyone who is thinking of seeking his fortune in South Africa. It gives much valuable information over a wide range of subjects, mentioning many undeveloped enterprises in addition to chapters on agriculture and mining. Plenty of time should be taken over the prospecting trip, the chief elements of success when one has decided on the plan of campaign being a good balance in the bank and unlimited push and grit.

030.5
46 T

LIBRARY
OF THE
UNIVERSITY of ILLINOIS

630.5
AG T



ROYAL AGRICULTURAL COLLEGE—SOUTH FRONT.

U. OF ILL.
JUL 15 1942
PER. DUPS.
COPIES

NEW SERIES.

Agricultural Students' Gazette.

VOL. X. APRIL, 1901. No. 3.

THE ROYAL AGRICULTURAL COLLEGE, CIRENCESTER.

ROYAL PATRONAGE OF THE COLLEGE.

PATRON: KING EDWARD VII.

It is with great pleasure that we record that His Majesty the King has signified, by Royal command, to the Chairman of the Governing Body (the Earl of Ducie) that he grants his patronage to the College. The first patron was the late Prince Consort, and afterwards until the decease of her late Majesty, the Prince of Wales.

The following letter has been received by the Earl of Ducie, Chairman of the Governing Body of the College:

Privy Purse Office, Buckingham Palace,
March 11th, 1901.

My Lord,—I have the honour to inform you that I have submitted to the King your letter of the 16th ult., and in reply I am commanded to say that His Majesty is pleased to accede to the request to grant his patronage to the Royal Agricultural College, Cirencester.—I am, my Lord, your obedient servant,

(Signed) D. M. PROBYN, General,
Keeper of H.M.'s Privy Purse.

The Right Hon. the Earl of Ducie.

"GOD SAVE THE KING, OUR PATRON."

For the accompanying reproduction of a photograph of the College we are indebted to the kindness of the Rev. the Principal.

LAWES' PORTRAIT FUND.

To the list of subscribers towards the reproduction of the portrait of Sir J. B. Lawes given in our last should be added the name of A. E. McLeod.

We were indebted to R. Warington, Esq., for the photographic positive from which the photogravure was made.

The total cost of the reproduction and printing the necessary number of copies was about £25. Nearly all the cost was defrayed by the donations of the 47 subscribers. We understand that the reproduction is thought very highly of by many friends of the late Sir John. There are a few large paper copies of the portrait suitable for framing for sale at 5s. each, and a few small paper copies at 2s. each. Apply to the publisher, G. H. Harmer, Cirencester.

THE WORKMEN'S COMPENSATION ACT, 1900.

Not so very many years ago the workman was very insufficiently protected against loss arising from injuries sustained in the course of his employment. When public opinion became thoroughly alive to this the pendulum began to swing in his favour, and now it possibly has swung rather far. On July 1st, 1901, the Workmen's Compensation Act of 1897 comes into operation as regards agricultural and horticultural labourers who are not included in the 1897 Act.

The definition of an employer is sweeping—"Anyone who habitually employs one or more persons in agriculture"—and agriculture is made to include horticulture and forestry. Further than this, a man employed part of his time in "agriculture" and part elsewhere is to be included.

It is desirable to review the present and past obligations of employers to workmen in order to make clear the great change which is coming. This can only be done generally in the space at disposal and the account can not be burdened with the mass of detail dear to the lawyer's mind.

What is now the liability of an employer ? It is two-fold. He is responsible by the Common Law, i.e., the law that is made by decisions of Courts and based on all kinds of maxims of what is believed to be justice. It is a law that is always with us and is essentially English. Judges have taken this maxim and that, this principle and that, and moulded them by a series of decisions extending over a great number of years into what is now a well settled system. Judges will not go behind these principles as they are now called except in the case of statute. To sum up the liability of an employer at Common Law it is this: A man must so use his possessions as not to injure others. But after all he owes this to the general public and until recent statutes his obligation was less to his servant than to the public. For instance a servant was supposed to voluntarily undertake certain risks in return for wages. "A man suffers no wrong who volunteers to undergo a risk." Then again there was the much abused doctrine of "common employment" whereby a man could not recover for injuries sustained at the hands of fellow workmen. Practically then the position of a servant in law (as distinct from statute) was and is that he can only recover for injuries due to his *employer's* negligence and he must not himself be guilty of any negligence (called contributory negligence) which caused or contributed to the injury complained of.

Now mark the course of legislation to deal with these conditions. First came the anomaly that a man had a personal action for his wrongs which died with him. Hence he could sue for an injury that nearly killed him, but his widow and children had no redress if it quite killed him. Lord Campbell's Act removed this anomaly in the early forties, giving the personal representatives a right of action with certain limitations as to time, &c. This was an act of real justice and has been largely availed of. The subsequent statutes can be summed up in the Employers' Liability Act and the present Workmen's Compensation Act. The former, and this is the point to notice, kept alive the principle that negligence alone entitles an injured workman to compensation, and that he must not himself have been guilty of negligence which contributed to the injury.

It also contained the principle that so often has defeated legislation, viz., allowing master and workmen to contract not to be bound by the Act. At the same time it was an advance. It largely did away with the doctrine of common employment. A master became liable now for injuries resulting from the negligence of his servant placed in any sort of authority. But the real reason why the Act has been thought inadequate is that negligence must be proved, and negligence is difficult to prove. The real point at issue was "Should a man be compensated for accident—a mishap that is no one's fault, neither his, nor his employer's, nor his fellow servant's?" The Workmen's Compensation Act, 1897, with its amending Act of 1900, applying it to agriculture, has supplied the answer. Unfortunately it has supplied the answer in a very unsatisfactory manner. Only recently in the House of Lords it was described as an "extraordinarily ill-drawn act," and almost any week's law reports give ample proof of the doubtful points left to be decided in Court. This very imperfection makes it worse for employers, as they may easily have the expense of litigation thrown on them as well as compensation.

This Act practically makes an employer an insurer of his workmen. The workman's right to compensation is only limited in the following ways: (*a*) The injury must arise from an "accident arising out of and in the course of his employment." There is now no need to prove anyone negligent. But it is sufficient for the present purpose to say that some injuries have been sued on which have been held not to be accidents of the kind specified. (*b*) It must not be caused by the workman's "serious and wilful misconduct."

It must be noted here that "contributory negligence" has gone, and it will only be some very gross misconduct causing the accident which will bar the workman's relief. No good will be gained by labouring the matter. Here is a new state of affairs, a new set of responsibilities created by statute which has got to be met and provided for. It must be evident to anyone that no amount of prudence can defeat the risk, and, it may be added, no amount of "contracting out" unless there is substituted a scheme which satisfies a Government Department as being at least equal in advantages from the workman's point of view. This clause is a salve to the apostles of "contracting out" and no good to anyone.

It will serve no purpose to elaborate the details of methods of procedure, notices, &c. The practical man will want to know what it will cost or rather what it may cost. To sum it up briefly—if a man is killed and has anyone dependant on his earnings the employer may have to pay a sum equal to his last three years' wages or £150 if the last three years' wages do not amount to so much. The real and material limit is £300. The Act says that no larger sum is to be recovered on death. There are other provisions where there are no persons wholly dependant or no dependants at all. But in the event of partial disablement a weekly payment of half the average weekly earnings *during incapacity* not to exceed £1 may be awarded. It is true that certain things such as sums actually earned are to be deducted, but the fact remains that the employer *may* have to pay a considerable weekly sum to a workman during his life.

This then is the position. It is a risk you cannot provide against other than by insurance. It may extend as a lump sum payment from £150 to £300 and as a weekly payment be almost indefinite. Insurance then is the only reasonable answer to the whole matter and it appears to be reasonable. A few shillings per £100 paid annually in wages is the sum asked by most insurance companies. It varies very greatly according as the employer takes the risk of the first fortnight or not, as many injuries do not much exceed that period. But insurance it must be as certainly as the wise man must insure his house against fire.

There only remains to be added that the Act last named leaves open all remedies that were in existence before. Thus, supposing that from negligence of the employer or his foremen, the workman may expect larger compensation than he would get under this Act, he is still entitled to proceed either under the Employer's Liability Act or under his rights at Common Law. Let anyone insuring, therefore, get joined in his new and added liability all those previous and still possible liabilities.

Temple, E.C. J. HENRY DUGDALE, M.R.A.C.

NOTES ON THE PRESENCE OF TUBERCLE AND DIPHTHERIA BACILLI IN MILK.

By CECIL DUNCAN, F.I.C., &c.

Milk is an admirable medium for the rapid development and multiplication of micro-organisms. Micro-organisms are always present in milk unless it is drawn from the udder under sterile precautions. If the udder is diseased the milk will seldom be free from micro-organisms, even when collected under sterile precautions.

Milk is contaminated in many ways. This may take place in the udder itself, as, for example, when the udder is tubercular; or the source of contamination may be the dirty hands and infected breath of the milker, or the dust and dirt of improperly kept dairy vessels.

Water (added by the thrifty dairyman) is perhaps the most serious source of contamination. The water (frequently from a well) may be contaminated with sewage containing vast numbers of micro-organisms. Some of these may be pathogenic, and if taken into the body will probably cause either diphtheria, typhoid, cholera, or tubercle. Scarlatina, foot and mouth disease in man, and the diarrhœa of infants may be conveyed by milk which has been contaminated in some way.

In ordinary pure milk there are large numbers of bacteria. After standing in a room for an hour milk will frequently be found to contain from 1—5 thousand bacteria per cubic centimeter. In warm weather the number may reach 1 million. Cream and butter, as might be expected, contain very large numbers of micro-organisms. Fortunately these organisms are nearly always harmless, i.e., are not pathogenic, and therefore do not produce disease. Many produce lactic acid and make the milk sour, some form butyric acid and aid in the ripening of cream and cheese, whilst others give rise to the "faults" in milk, viz., bitter milk, viscid or ropy milk, blue, red, and yellow milk.

Not infrequently the so called pure milk contains pathogenic or disease forming organisms, and to two of these—diphtheria and tubercle—I would like to call special attention.

All the common organisms present in pure milk, as well as the organisms producing diphtheria, tubercle, typhoid, and cholera may be destroyed by boiling the milk for five or ten minutes. This "sterilisation" alters the flavour of the milk. The flavour is, however, very slightly altered when the milk is "Pasteurised," that is, when heated to 68° C., for 20—30 minutes. This temperature is sufficient to destroy the common and pathogenic organisms present in the milk.

TUBERCLE BACILLI IN MILK.

The number of tubercle bacilli in milk taken from a tubercular udder is not large. The presence of the bacilli from the udder or from sputum, &c., may be determined by the following methods :—

(*a*) Microscopic examination of the stained milk.

(*b*) Microscopic examination of the sediment formed after the milk has been centrifugalised for about ten minutes. The layer of cream forming on the surface should also be examined.

(*c*) By inoculation.

(*a*) and (*b*). A drop of the milk is taken up by a sterilised platinum wire and spread over several clean cover-glasses. These are dried in the air and then passed rapidly through the flame of a Bunsen burner three times, taking care that the side of the cover-glass with the dried film of milk is uppermost. The prepared cover-glasses are then immersed in hot Ziehl-Neelsen solution* for five minutes. Remove the excess of stain by washing with distilled water, and decolourise the stained films with 30% nitric acid solution. Wash well with distilled

---

* Ziehl-Neelsen solution (Carbol-Fuchsin) :

Take Fuchsin	1 part.
Absolute Alcohol	10 parts.
Five per cent. Aqueous Solution of Carbolic Acid	100 parts.

Dissolve the fuchsin in the absolute alcohol and then mix with carbolic acid solution. This stain keeps well.

water and counter-stain for one minute in Löffler's alkaline methylene blue*, wash in distilled water, dry and mount on a glass slide in Canada-Balsam. By this treatment the tubercle bacilli in the milk will appear when examined under the microscope with a $\frac{1}{12}$ oil immersion objective, as delicate red rods, often beaded or segmented and curved, on a blue background composed of cells, pus, or bacteria. See Figure 2, which shows a specimen of tubercular sputum, with the characteristic tubercle bacilli stained red. By this direct method of examination it is very difficult to detect the tubercle bacilli, because they are never present in the milk in large numbers. This difficulty may be overcome to a certain extent by examining the sediment obtained by treating the milk in a centrifugal machine for 10 minutes. The sediment containing the bacilli is stained by the method just described and examined under the microscope.

(*c*). The only certain method is the inoculation method, in which a guinea pig is inoculated with 0·5—1 cc. of the milk or sediment. The animal is inoculated subcutaneously in the thigh, and if tubercle bacilli are present the animal will show signs of tuberculosis in 14 to 20 days after inoculation. The material found at the seat of inoculation and portions of the spleen (which will be covered with minute tubercles if the milk contains tubercle bacilli) must be stained and examined as described in (*a*) and (*b*).

By this last method, it should be noticed, tubercle bacilli can only be detected in butter and cream with certainty because these substances frequently contain bacilli which also stain red. They are not pathogenic and therefore not tubercle bacilli.

DIPHTHERIA BACILLI IN MILK.

It has been stated that cows suffer from this disease and produce a milk which, on consumption, has caused outbreaks of diphtheria. This is, however, a disputed point. In man it is distinctly a disease of the young, especially at ages from two to ten. The seat of infection is usually the throat, but frequently the nasal passage or passage to the ear is infected. A worker in the dairy suffering from the disease or having been in contact with a case of diphtheria can infect large quantities of milk during the process of milking and start diphtheria epidemics.

The presence of diphtheria bacilli in the throat of healthy individuals has been observed on several occasions. They were probably not virulent, but it is quite possible for these infected individuals to pass the bacilli to others or into dairy produce, in which the conditions for growth might be much more favourable. This might account for outbreaks of the disease in what have been diphtheria-free districts.

---

* Löffler's Alkaline Methylene Blue :
Take Concentrated Alcoholic Solution of Methylene blue... 30 cc.
Solution of Caustic Potash, 0·01 per cent. .. ... 100 cc.
A stain which keeps well.

AGRICULTURAL STUDENTS' GAZETTE.

SECOND SERIES. BACK NUMBERS.

Back Numbers of Vols. I., II., III., IV., V., VI., and VII. may be obtained at half-price, excepting those containing Sir J. H. Gilbert's Lectures and the special Jubilee Number, which are 1s. each.

All the parts of Vols. VIII. and IX. may also be had at published price.

Apply to the Publisher.

TWO or more FARM PUPILS wanted, as Out Students, by a man farming 1,000 Acres in the Isle of Wight.—HENRY WAY, M.R.A.C., Pyle, Chale, Isle of Wight.

GEORGE F. DAVIS,

Tailor and Breeches Maker,

CIRENCESTER.

Specialty—BREECHES.

◆◆◆◆◆

Foreign and Colonial Outfits.

◆◆◆◆◆

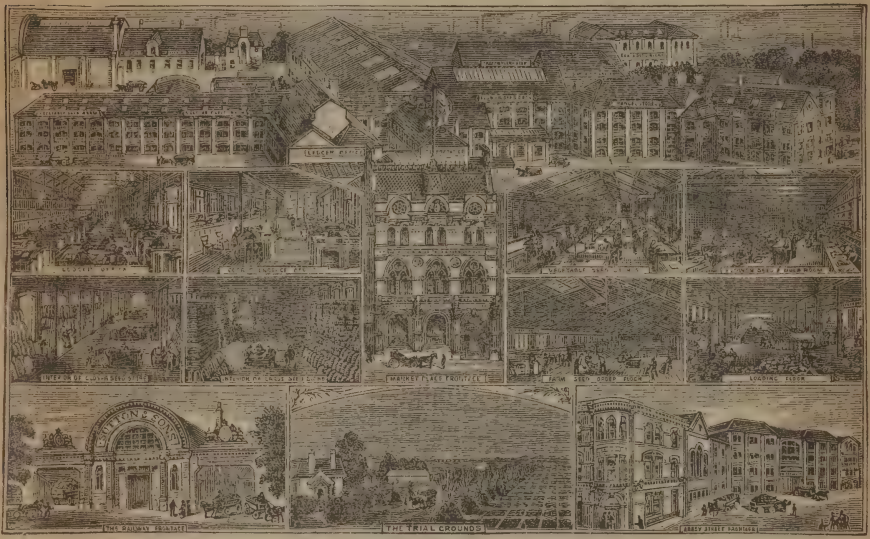
PATTERNS and SELF-MEASUREMENT CARDS sent Post Free to any part of the world. FIT GUARANTEED.

Numerous Testimonials from Old Students, Officers, and other Patrons at Home and Abroad.

BY ROYAL WARRANT. BY ROYAL WARRANT.

SUTTON'S SEEDS

IN USE THROUGHOUT THE WORLD.



A Miniature View of the Royal Seed Establishment, Reading.

Sutton's Grass Seeds.
Sutton's Farm Seeds.
Sutton's Garden Seeds.
Sutton's Flower Seeds.

Grown and selected year by year from the finest Stocks in existence.

All Seeds Free by Post or Rail. See Terms.

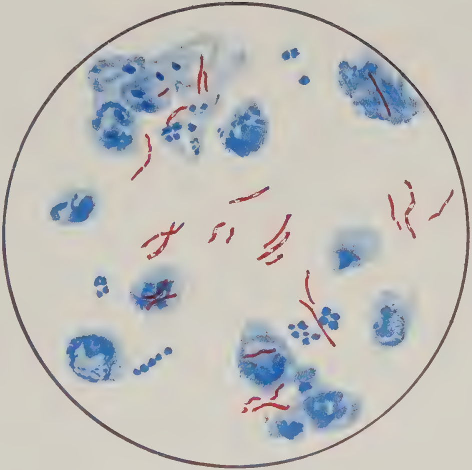
PRICED DESCRIPTIVE LISTS POST FREE ON APPLICATION.

Seedsmen by Royal
Warrant to
H.M. the QUEEN.

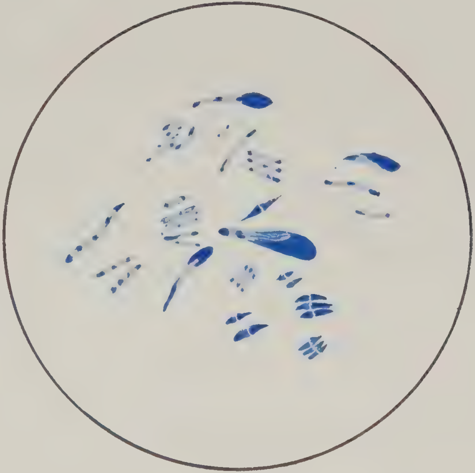
Seedsmen by Royal
Warrant to H.R.H.
The PRINCE of WALES.

READING, Sutton & Sons **BERKS.**

Printed and Published for the Proprietors by George Henry Harmer, at the Office,
Lewis Lane Cirencester, August, 1900.



2.



3.

LIBRARY
OF THE
UNIVERSITY of ILLINOIS

Diphtheria bacilli rapidly grow in milk, which may be seen from the following experiments of Schotellius.

This observer took a small quantity (1 cc.) of a pure culture of diphtheria bacilli which was added respectively to 20 cc. of broth, and 20 cc. of fresh milk, and 20 cc. of boiled milk. The fresh milk was obtained direct from the cow's udder, which was previously cleansed. According to the calculation of this observer, 1 cc. of each of the three culture fluids yielded the following number of colonies, as estimated by a plate culture after six hours' cultivation at the temperature of the room :—

Fresh milk ... ... = 21,280,000 diphtheria bacilli.
Boiled (sterilised) milk ... = 2,280,000 ,, ,,
Broth ... ... = 7,600,000 ,, ,,

After longer incubation at 37° C. :—

Fresh milk ... ... = 50,160,000 diphtheria bacilli.
Boiled (sterilised) milk ... = 6,080,000 ,, ,,
Broth ... ... = 18,240,000 ,, ,,

Several outbreaks of the disease have been traced to milk coming from a farm where cases of diphtheria existed. To a farmer selling milk an outbreak of the disease upon the farm is a very serious matter, because customers will cease taking the milk for fear of infection.

The presence or absence of diphtheria bacilli in the throat and in milk may be determined as follows :—

In the throat. Any case of sore throat (mild or otherwise) should be examined for the bacilli. A plug of cotton wool at the end of a stout piece of wire (called a swab) is sterilised by heating in steam (from kettle) for two or three minutes, cooled, and then rubbed firmly over the sore throat. If diphtheria bacilli are present, some probably will be taken up during the swabbing. The swab is smeared over two or three clean cover-glasses, dried and fixed by passing rapidly through the flame of a Bunsen burner three times. Stain for five minutes in Löffler's alkaline methylene blue. Wash off the excess of stain, dry, mount on slide in Canada balsam, and examine for diphtheria bacilli with a $\frac{1}{12}$th oil immersion objective. The bacilli stain irregularly (deeply stained portions alternating with paler intervals). The ends of the bacilli are frequently more deeply stained than other parts, this is the so-called polar staining, while the phenomenon known as "metachromatism," is often marked at the poles and also in the rod, appearing as granules of a purplish tint, contrasting with the blue of the methylene blue. The bacillus of diphtheria is a very small delicate rod, frequently curved, with rounded ends, and varying in size from 1 to 2 μ in length and about 0·2—0·3 in breadth (1 $\mu = \frac{1}{25000}$ of an inch). The bacilli frequently exhibit clubbing and parallel grouping. (See Fig. 3.) The pseudo form has pointed ends. If no typical bacilli are found, a blood serum* culture of some of the material from the swab must be made. To do this the swab is rubbed over the surface of the blood serum, and the culture incubated at blood heat for about 18 hours. All diphtheria bacilli left on the blood serum by this treatment will rapidly increase in number, and if portions of this culture are placed on clean cover-glasses, dried, fixed, and stained, as described above, and examined under the microscope, the typical bacilli will be seen. If typical bacilli are not detected by this method, the sore throat is probably not diphtheritic.

---

* The clear serum of blood slightly coagulated by heat.

In milk. The examination of milk after staining with Löffler's alkaline methylene blue is unsatisfactory, because a small bacillus can often be cultivated from milk which closely resembles the diphtheria bacillus, but differs from it in not being pathogenic. Subcutaneous injection in guinea pigs of the milk is the only certain test. A small quantity of the milk is used, and 36—40 hours later the animal is killed and examined for the typical lesions of the kidneys, &c. The material found at the seat of inoculation is examined for the typical bacilli, which are never numerous, by means of Löffler's stain.

THE PRESERVATION OF TIMBER BY ARTIFICIAL MEANS.

1. General Remarks.

The preservation of timber in the innumerable uses to which it is put has, for a considerable period of time, engaged the attention of experimenters, and various methods have been devised and introduced with a view to satisfactorily attaining this object.

The advantage of some such process must have become increasingly apparent to all those who are responsible for the upkeep and maintenance of estates, and also to agriculturists in general. The necessity for keeping all branches of expenditure within the strictest limits, which the condition of agriculture in recent years has enforced on landlord and tenant alike, as well as the increased cost of both labour and material, has led to various endeavours being made to reduce the cost of maintaining and renewing fences, and other woodwork.

In spite of the enormous importance of foreign timber (*), it may be assumed that almost the whole of the material used for fencing purposes is home grown, and consists, in most parts of the country, of oak, larch, and Scotch pine, although other species—ash and other hard-woods, spruce and silver fir—are used in some districts. Most of this timber has, in all probability, been grown in over-thinned and under-stocked woods, which are only too common, and will consequently be rough and knotty, and consist of quickly grown soft wood, with wide annual rings. The durability of larch is not seriously impaired by such management, or rather want of management, but with Scotch pine

---

(*) The value of the imports of timber in 1899 was returned at £22,188,238, of which £19,000,000 was coniferous wood. The average value of hewn fir was returned at 29s. per load of 50 c. ft, and of sawn fir at 48s. 4d. per load.

the case is quite different, and the life of fencing posts cut from timber of this description does not exceed a few years. The durability of the coniferous timbers is supposed to vary according to their specific gravity (*), but no definite rule can be formulated in this respect. The lesser or greater abundance of the resinous secretions, and the conditions under which the timber crop has been grown, are important factors. In districts where plenty larch is available no difficulty may be found in obtaining good durable fencing material, but owing to the ravages of larch disease *(Peziza Willkommii)* these favoured localities are not so numerous as they once were, and the increasing scarcity of larch, even in districts favourable to its growth, has tended to raise the price considerably over the whole country. Good straight, clean grown oak, which will split well, now fetches a price which renders it a very expensive fencing material.

It thus appears that Scotch pine is the cheapest and most generally used timber for fencing. It undoubtedly forms the bulk of our coniferous woods, and in northern districts predominates over all other species. Its principal defect, even when properly grown, is want of durability, as compared with larch, when exposed to atmospheric influences. Scotch pine is therefore particularly suited for treatment with a preservative material, and its value is very considerably enhanced thereby.

2. MATERIALS USED FOR THE PRESERVATION OF TIMBER.

Among the principal substances employed for the preservation of timber from decay may be mentioned paint, tar, varnish, sulphates of iron, zinc, and copper, chlorides of iron, zinc, and mercury, sodium sulphate, and heavy tar oils (creosote). The first three named are only applied as an external coating to the timber, and are almost universally used for the preservation of the outside woodwork of buildings, &c. If fresh coats are applied at regular intervals, woodwork may thus be preserved from the destructive influences of moisture, insects, and fungi for an indefinite period.

For the preservation of timber in contact with, or partly buried in, the soil, the mere coating of the surface with paint, varnish, or tar is insufficient, and it is found in the case of railway sleepers, poles, and posts of any description that the portions immediately on the ground surface soon show a tendency to decay. This is very commonly seen in old gate posts, which, when removed, often appear to be almost wasted through at the "collar," or the point where they first come in contact with the earth. It is to this class of material, therefore, that the method of complete saturation with a preservative chiefly applies, and the other substances above referred to have all been employed for injection purposes.

The use of the various metallic salts is open to more or less objection, some being readily soluble, and therefore liable to be washed out of

---

(*) The specific gravity of seasoned larch is ·59, Scotch pine ·52, silver fir ·47, and spruce ·45.

the timber; some re-act strongly on the iron or other structural materials with which the wood may be in contact, and some, moreover, are violent poisons, and require careful handling. There remains, therefore, the use of heavy tar oils, commonly called creosote, which is now the process in general use in this country—a process which is free from nearly all the disadvantages arising from the use of metallic salts in solution.

3. Creosote and Creosoting.

The creosote of commerce, utilised for the preservation of timber, is not, as its name would imply, in the stricter chemical sense, a product of the destructive distillation of wood, but is obtained from the distillation of coal tar, the greater part coming over by the time a temperature of 600°Fahr. is reached. Its specific gravity is about 1·05. (*) If within reasonable distance of a market, the wholesale price under favourable circumstances, should not exceed 3d. per gallon delivered at the nearest railway station.

The creosoting plant is a comparatively simple one, and may be conveniently worked in connection with an estate sawmill, or driven by a traction or portable engine. The receiver consists of an egg-ended cylinder, and very much resembles an ordinary boiler. It is about five feet in diameter, and for usual estate purposes eighteen to twenty feet in length. This admits of the treatment of 18 feet paling bars, large posts for sheds, etc., in addition to the ordinary fencing materials of smaller dimensions. One egg end of the cylinder forms a hinged door, which, although massive and of great weight, is readily opened and shut, being firmly secured when closed by screw bolts and suitable packing. The storage tank for creosote is usually placed immediately below the receiver or cylinder, and requires to be of sufficient capacity to easily fill the receiver when packed with timber. A convenient sized tank for a receiver of the above dimensions is one made to contain three thousand gallons. The receiver is connected with the tank beneath by a vertical pipe, and a spring safety valve is fitted *beneath* the receiver and immediately over the tank. This safety valve comes into operation every time the cylinder is used, and acts equally as a "blow-off" when the requisite pressure is reached. Owing to the nature of the creosote, it is found impossible in practice to fit an ordinary pressure gauge, as the tube becomes clogged in a very short time. It is desirable also to have an air cock on the top of the cylinder, the use of which will be subsequently explained. An air pump, and lift, and force pump are situated near the receiver, and may be conveniently placed in an adjoining apartment. These pumps are driven by the same power as is utilised for the sawmill or by a separate engine. A strength of three or

---

(*) Dr. Tidy's Specification, which is that generally adopted, stipulates that it shall contain a total of 8% tar acids, and that not less than 25% be non-volatile below 600°F. This standard has hardly been reached by a sample kindly analysed by Professor Kinch at the R.A.C. Laboratory which showed ;—S.G. 1·016, tar acids 20%, not distilling below 315°C. 15%.

four horse-power is quite sufficient. The air pump is connected with the receiver only, the lift pump with the tank, and the force pump with the receiver.

In commencing operations, the receiver is first packed as closely as possible with the timber to be treated, and the door is thereafter closed and firmly screwed up and secured. (*) All cocks and connections with the receiver are closed. The connection with the air-pump is first opened, the pump set to work, and the air in the receiver and also in the pores of the wood is exhausted as far as possible. This operation may take from twenty minutes to half an hour. As soon as the air has been sufficiently exhausted, the connection to the air pump is closed, and the cock on the vertical pipe between the storage tank and the receiver opened. Owing to the vacuum within the latter, the creosote is sucked up the pipe, and fills the receiver more or less completely. As soon as the creosote ceases to draw into the receiver, the cock on the vertical pipe is closed. The lift and force pump is connected with both tank and receiver, and creosote is forced into the latter until a pressure of at least 70lbs. per square inch is reached, when creosote begins to blow off in a fine spray from the safety valve and falls back into the tank. The safety valve, which consists merely of a powerful spring, can of course be adjusted to any pressure, but seventy pounds is found to work very satisfactorily as an average. This pressure is maintained in the receiver for about two hours in the case of small material, not exceeding three inches diameter, but for larger pieces a longer period is necessary to insure thorough saturation. During this time the lift and force pump is now and again put in motion for a few minutes in order to maintain the pressure, which has a tendency to fall as the creosote is absorbed by the wood. After the treatment has continued for a sufficiently long time, the connections with the lift and force pump are closed, and the cock on the vertical pipe into the storage tank re-opened, when all unabsorbed creosote flows back from the receiver. As soon as the normal atmospheric pressure has been reached, the remaining creosote in the cylinder will refuse to flow back from want of air to replace it, being in fact very like a tumbler of water inverted over water. It is in order to obviate this difficulty that the air cock on the top of the receiver is fitted. By opening this, air is admitted to the cylinder, and the remaining unabsorbed creosote readily drains back to the tank. The door of the receiver is then unscrewed and opened, and the creosoted timber removed. A certain amount of creosote, held by capillary attraction between the pieces of sawn timber, will probably be found to trickle out at the door as the wood is removed, and in order that this may not be wasted, it is advisable to have a small square of cement beneath the door, from which a gutter and pipe leads back to

---

(*) It is very important in order to obtain successful results, that the wood should be fairly well seasoned and air dried. The excessive moisture in newly felled and freshly sawn wood seriously obstructs the entrance of the creosote into the centre of the pieces under treatment.

the storage tank. Provided two men are employed for handling the material, and the work is expeditiously carried through, it is easy to treat two lots in a day's work.

The creosoted timber, as it is taken out from the receiver, is stacked in open piles to dry, which it does very quickly. The newly treated wood is of a chocolate brown colour, which it usually maintains; but in some cases the timber assumes the peculiar lustrous black which is often noticeable on railway sleepers and telegraph poles.

As mentioned in the first part of this article Scotch pine is undoubtedly the timber in most general use for estate purposes, and it is to the creosoting of Scotch pine timber that this article refers, it being the only species the treatment of which has come within the writer's experience on a large scale. Most of the less durable timbers, such as silver fir, spruce, and Weymouth pine amongst conifers, and birch, poplar, and lime amongst deciduous species could no doubt be creosoted with great advantage.

To consider the practical and financial aspect of the question, it may be stated in the first place that a plant such as above described can be erected for about £350, including the cost of storage tank, pumps, &c. Of course if no power is available for driving the pumps, and a special engine has to be obtained, the cost is thereby considerably increased. It is desirable to have the creosoting cylinder under cover of a shed, with the egg end forming the door projecting outside for convenience in handling material. If no existing building is available there is some additional expense on this account, and as creosote is highly inflammable the less woodwork there is about the building the better.

The amount of creosote absorbed by seasoned timber approximates very closely to one gallon per cubic foot, and this amount would probably hold good for most softwoods, although the heavier hardwoods, such as beech, would most likely absorb much less.

A convenient charge, to completely fill the cylinder would be, say, 600 paling bars and 140 paling posts, the former measuring 18′ × 3½″ × 1″, and the latter 4′ 6″ × 3″ × 3″, equivalent in all to about 300 cubic feet. Other material would be in proportion.

Supposing that, at a moderate estimate, 20,000 cubic feet per annum are treated, the cost for wear and tear and depreciation at 10% would amount to about ½d. per cubic foot. As a matter of fact the wear and tear would no doubt be very much less, the only part of the plant ever likely to require repair being the pumps.

The cost of a single charge may thus be stated as under:

	£	s.	d.
300 gallons of creosote at 3¼d. per gallon (including carriage from station and return of empty casks to manufacturers)	4	1	3
Men's wages (engine driver and two others) for half-day	0	5	0
Use of engine for half-a-day, including coal, &c. ...	0	7	0

	£	s.	d.
Wear and tear of plant (as above) at ½d. per cubic foot treated	0	12	6
	£5	5	9

Equal to 4·23d. per cubic foot.

The market value of the untreated material in this district (South of Scotland) may be stated as under :—

	£	s.	d.
600 rails at 6d.	15	0	0
140 posts at 2½d.	1	9	2
	£16	9	2

The treated material commands a market value fully equal to that of the best larch, which may be stated as under :—

	£	s.	d.
600 rails at 10d.	25	0	0
140 posts at 6d.	3	10	0
	£28	10	0

It will be observed that while the value of rails is increased from 6d. to 10d. or 66%, the value of posts is increased from 2½d. to 6d., or 140%. This is no doubt due to the fact that untreated rails, not being in contact with the ground, are very much more durable than untreated posts, and the advantage from treatment is therefore less in the case of rails. If posts alone were taken into account in the above calculation, a much larger profit would be shown.

	£	s.	d.
Increased value of treated material	12	0	8
Less cost of treatment as above...	5	5	9
Profit...	£6	14	11

Equal to a profit of 5·36d. per cubic foot.

Ordinary mature crops of Scotch pine of say 5,000 cubic feet solid per acre do not fetch, in the south of Scotland, much more than £30 to £40 per acre, which is equivalent to about 2d. per foot quarter girth. Such crops, by the process of creosoting, will, at present prices, be worth after conversion, either for estate purposes or for sale, at least three times that amount, viz., £100 to £120 per acre.

Further figures are unnecessary to point out the advantages of the system, and it may only be added in conclusion that the Board of Agriculture has already agreed, in at least one case, to allow a loan from an Improvement Company, on the same terms as in the case of farm buildings, drainage, &c., for the erection of a creosote plant.

J. H. Milne Hume, M.R.A.C.

ATHLETIC SPORTS.

President.—Rev. J. B. McClellan.
Stewards.—Prof. Kinch, Prof. Paton, Prof. Blundell, H. A. Bonnin, H. B. Beddall, D. E. Hervey, R. H. Keane, V. D. Stenhouse, A. W. Wilson.
Hon. Secretaries.—E. M. Wason and E. Walford.
Judges.—Prof. West, Prof. Wooldridge, Mr. E. B. Haygarth.
Starter.—Mr. J. A. Ross-Hume. *Time Keeper.*—Prof. Locke.

The Annual Sports were held on Wednesday and Thursday, March 27th and 28th, occupying the afternoon of the first day and the whole of Thursday. On both days the races were excellent and the weather abominable, the final for the 220 yards handicap on Thursday being run in a snowstorm. The Medal, for the greatest number of marks, went to Walford, who thus repeated his success of a year ago, the runner-up being Beddall, who secured 42 marks whilst the Medal was won with a total aggregate of 49. Hartley's victory over Beddall in the mile practically decided the fate of the Medal, as up to that time it looked as if Beddall would secure it. The most pleasing feature of this year's sports was the really admirable amount of training which took place, and the value of which was practically demonstrated by the number of excellent races and finishes. To mention only a few of these, the finishes in the Quarter Mile Open, Half Mile Handicap, Open Mile and Three Miles were quite excellent, and instead of one competitor standing out by himself and winning by "yards," the verdict in the shorter races was both in Quarter Mile Open and Half Mile Handicap "inches" only. In our opinion one of the best performances of the day was Hartley's victory in the Mile. He ran exceedingly well and also with excellent judgment, as Beddall's spurt was a very strong and long one, and it says a great deal for Hartley that he kept enough in himself to pass Beddall half way down the straight and then win by eight yards. To our mind there is no doubt he should have won the Three Miles, as he finished strongly and full of running, whilst Barton, the winner, who ran an exceedingly plucky race, was "wobbling" all over the course in the final run in, and had Hartley's spurt been timed a little earlier and had he once collared the winner, plucky as he was, there is no doubt the race would have been Hartley's. Barton ran a really good race and was taken along the first two miles at a great pace by Crewdson.

The One Hundred Yards was won by Bonnin in 10$\frac{4}{5}$ seconds, not so good as his time last year, but he was probably feeling the effect of his recent illness. Walford jumped over 19 feet in the Long Jump, and this was good enough to win it The High Jump got to 4 feet 10$\frac{1}{4}$ inches, and out of the three competitors left in not one was found able to jump the extra $\frac{1}{4}$ inch to make it 4 feet 10$\frac{1}{2}$ inches, so the stakes were divided.

The Tug of War, regarded as a certain win for the In Students, went to the Out Students' Team, who pulled their opponents over fairly easily. The In Students' Team deserved to win, as they had been practising regularly and had earned the "pipes," but they were so long in getting a good "pull" on that they were over the line each time before they got together.

The Donkey Race was as usual provocative of much mirth and was a great improvement on recent years, as the course was kept clear and no "outside" assistance was allowed. The following is a copy of the Race Card :—

THE ASS STAKES.

Open to Members of the R.A.C. About half-mile over beautiful pasture land. The winner to receive first prize. Genuine donkeys only allowed to compete.

PROBABLE STARTERS.

Jockey.	*Donkey.*	*Costume.*
Mr. A. W. Wilson's	"Voirlet"	Knave of Hearts
Mr. D. G. Hervey's	"Tammie"	King of Diamonds
Mr. F. Osmond Smith's	"Mooncalf"	The Pink 'un
Mr. M. F. Irwin's	"Irish Member"	Turk
Mr. G. J. Wilson's	"Tickle"	Smoking Costume, 18th Century
Mr. F. Whitehead's	"Sheep-pen"	Little Bo Peep
Mr. V. D. Stenhouse's	"Gold Medal"	Working Man
Mr. J. Crewdson's	"Scrum"	Feste
Mr. L. J. Darling's	"Tankard"	Queen of Spades

LATEST SCRATCHINGS.

Prof. Wooldridge's *Hard Luck*, by "Death" (out) of "Patients."
Prof. Paton's *Theodolite*, got by "Herbert" out of "Lecture-Room."
Mr. Rowe's *Wardrobe*, got by "Promise" out of "Wakefield."
Mr. Trestrail's *Damages*—"Gotem" out of "Olivera."
Mr. Hancock's *Stature*—"Height" out of "Proportion."
Mr. Wason's *Appetite*—"Last" out of "Hall."
Mr. Hunt's *Average*—"Five" out of "Century."
Mr. Pennington's *Coca Champagne*—"Nerves" out of "Order."
Mr. Salvago's *Forelock*—"After Footer" out of "Curl."
Mr. Ashton Smith's *Ousted*, by "Rival" out of "Argyle."
Mr. Walford's *Syndicate*, by "General Opinion"—"Sharkers."
Mr. Radford's *Gramaphone*—sire, "New Records"—dam, "The Expense."

N.B.—No outside interference or assistance is allowed. Competitors receiving any help are disqualified, and must immediately retire from the course.

Visitors are particularly requested to keep off the course.

Mr. G. J. Wilson's Tickle was first, Mr. Osmond Smith's Mooncalf second, Mr. Irwin's Irish Member third, and Mr. Crewdson's Scrum fourth. The winner was a donkey who resides not a hundred miles from Coates, and who has often figured in the race before, this being his second win. The Costume Prize was awarded to Mr. F. Whitehead, who looked most charming as Little Bo-Peep. Mr. F. Osmond Smith is to be commended for his enterprise and for the "aplomb" with which he wore a somewhat trying costume.

The arrangements were excellently carried out by a Committee consisting of Professor Kinch, H. B. Beddall, H. A. Bonnin, D. G. Hervey, R. H. Keane, V. D. Stenhouse, and A. W. Wilson, with E. M. Wason and E. Walford as Secretaries, and much of the success of the meeting was due to the energy and foresight of the two latter. A very pleasing feature was the increased subscription list, and especially that a much larger proportion of students than usual subscribed to the Sports, thereby showing their interest and keenness; no less than 95 per cent. of the students were entitled to compete in all events.

During the afternoon of the second day the Cheltenham Military Town Band played a diversified and good selection of music, under the conductorship of Mr. J. Hall.

The Prizes and Challenge Cups, including the Golf Challenge Cups, were kindly distributed by Mrs. Stenhouse. Medal, E. Walford. Challenge Cup for Jumping contests, E. Walford. Challenge Cup for Mile, R. Hartley. Challenge Cup for Three Miles, R. C. Barton. The Senior Golf Challenge Cup, Eddison. The Junior Golf Challenge Cup, Prof. West.

The Principal proposed a vote of thanks to Mrs. Stenhouse, and after cheers for Mrs. McClellan and Mrs. Stenhouse, and a brief reply from Mr. Stenhouse, the proceedings terminated.

Appended are the results of the contests:—

100 YARDS.—*First Heat*: Bisdee, 1; Hervey, 2. Time, 11 2-5th secs.—*Second Heat*: G. J. Wilson, 1; Aspinall, 2. Time, 11 2-5th secs.—*Third Heat*: Walford, 1; Lindsell, 2. Time, 11 3-5th secs. *Fourth Heat*: Bonnin, 1; Darling, 2. Time, 11 secs.—*Semi-final (first)*: Bonnin, 1; Walford and Aspinall, 2. Time, 10 4-5th secs.—*Semi-final (second)*: Hervey, 1; G. J. Wilson, 2. Time, 11 1-5th secs.—*Final*: Bonnin, 1; G. J. Wilson, 2; Aspinall and Walford, 3. Time, 10 4-5th secs. Bonnin was a clear winner; the others finished in a cluster.

LONG JUMP.—Walford, 1, distance, 19ft. 6in.; Darling, 2, distance, 17ft. 7in. Burrell was third.

200 YARDS HANDICAP.—*First Heat*: Bonnin, (scratch), 1; Hervey (10 yds.), 2; Farwell (16 yds.), 3. Time, 23 3-5th secs.—*Second Heat*: G. J. Wilson (16 yds.), 1; Walford (8 yds.), 2; Aspinall (10 yds.), 3. Time, 23 3-5th secs.—*Third Heat*: Irwin (16 yds.), 1; W. W. Thompson (18 yds.), 2; Darling (10 yds.), 3. Time, 23 1-5th secs,—*Final*: G. J. Wilson, 1; Bonnin, 2; Aspinall, 3. Time, 23 1-5th secs. Won by about half a yard; the same distance between second and third.

HALF MILE (OPEN).—Lindsell, 1; Walford, 2; Bisdee, 3. Time, 2 min. 19 3-5th secs.

THROWING CRICKET BALL.—Darling, 1 (distance, 84 yds. 1 ft. 5 in.). The qualifying distance being 85 yards, no prize was awarded. Darling failed to do himself justice, as in practice he had been throwing much farther than this.

PUTTING THE WEIGHT.—Beddall, 1 (distance, 31 ft. 1 in.); G. T. Wilson, 2 (distance, 28 ft. 3in.). Keane was third.

THREE MILE RACE.—Barton, 1; Hartley, 2; A. W. Wilson, 3. Time, 17 min. Barton won easily. Hartley misjudged the race, finishing quite fresh. A close third.

BICYCLE EGG AND SPOON RACE.—*First Heat*: Patten, 1; Hervey, 2.—*Second Heat*; Bazalgette, 1; G. Wilson, 2.—*Third Heat*: Walford, 1; Keane, 2.—*Final*; Patten, 1; Walford, 2.

THREE-LEGGED RACE, 100 YARDS.—*First Heat*: Walford and Gawthropp, 1; Whitehead and Lindsell, 2; Bazalgette and Eddison, 3. Time, 14 3-5th secs. —*Second Heat*: Pennington and Wason, 1; Beddall and Patten, 2; Crewdson and Bonnin, 3. Time, 14 2-5th secs.—*Final*: Lindsell and Whitehead, 1; Beddall and Patten, 2. Time, 12 2-5th secs.

QUARTER MILE (OPEN).—Walford, 1; Bonnin, 2; Lindsell, 3. Time, 56 3-5th secs. A very close finish, Walford winning by inches only. Bonnin was handicapped by the effects of a recent illness.

WALKING RACE (first prize presented by Mr. and Mrs. Swanwick).—Beddall, 1; Eddison, 2; Keane, 3. Time, 18 min. 26 secs. Beddall won easily. The time of the first mile was 9 min. 21 secs.

THROWING THE HAMMER.—Beddall, 1 (distance, 71 ft. 8 in.); Keane, 2.

HURDLES.—*First Heat*: Walford, 1. Time, 20 2-5th secs.—*Second Heat*: Aspinall, 1. Time, 21 1-5th secs.—*Third Heat*: Lindsell, 1. Time, 24 secs.—*Final*: Walford, 1; Lindsell, 2. Time, 19 4-5th secs.

TUG OF WAR (eight a side).—Out-students pulled in-students over twice in succession and won.

MILE (OPEN).—Hartley, 1; Beddall, 2; A. W. Wilson, 3. Time, 5 min. 10 2-5th secs. A very good race. Hartley spurted away from Beddall and won by about eight yards, a similar distance separating second and third.

SACK RACE.—W. W. Thompson, 1; Bisdee, 2; Bazalgette, 3.

HIGH JUMP.—Four competitors jumped. G. J. Wilson succumbed, and singularly enough the three others, Bisdee, Walford and Hervey, tied, the height being 4 ft. 10¼ in.

HALF-MILE HANDICAP.—A. W. Wilson (scratch) 1; Bisdee (scratch) 2; Pennington (30 yds.) 3. Time, 2 min. 24 secs. A close race. Bisdee reserved his spurt too long.

CONSOLATION RACE.—Burrell, 1; Farwell, 2; Sandford, 3. Time, 18 secs.

ABORTION IN CATTLE.

By PROFESSOR G. H. WOOLDRIDGE, M.R.C.V.S.

The disease of abortion was evidently known in some form to the ancients, as is apparent from the references which are made to a cast calf in Exodus and in the Book of Job (Job xxi. 10).

Abortion is defined to be a premature expulsion of the embryo or fœtus before development has advanced to a sufficient extent to render the animal capable of living when separated from the mother.

The average period of pregnancy of a cow is about 284 days. The embryo or fœtus, however, may be expelled from the uterus at any time before the expiration of the full period of gestation. If the fœtus is expelled before the 34th week the cow is said to have "aborted." If that period is exceeded but the full term of pregnancy not reached, it is regarded as "premature birth." In the latter case the calf is often born alive and may even attain maturity. It is, however, usually of diminutive size and constitutionally weak, and except under special circumstances seldom worth rearing. It is not often that a calf born before the thirty-fourth week survives. It is usually stillborn. In some parts of the country if a fœtus is expelled at any time previous to the full term of pregnancy, the cow is said to have "picked" her calf, or to have "cast" her calf; or to have "warped."

The process of abortion comprises the disconnection of the embryo from the organism of the dam, and its discharge from the uterine cavity. All pregnant animals are liable to abort, but among the domesticated animals it is most common in the cow. It occurs in cows at all ages and seems to be commonest about the seventh month, and next about the fourth month of the period of gestation.

Abortion may be studied under two heads, viz. : (1) Sporadic and (2) Epizoötic abortion.

Sporadic abortion is that form which only occurs in isolated cases and shows no tendency to spread from animal to animal. When the disease appears amongst a number of animals and invades the surrounding district without regard to physical or climatic conditions, it is said to be *Epizoötic* or contagious.

Sometimes "Enzoötic" abortion is spoken of : by this is meant that form which appears in a certain district but which shows no tendency to spread to the surrounding districts. Examples of this are sometimes found in low-lying districts where ergotised grasses are found.

Causes of abortion. These are very numerous and diverse, and we will first proceed to consider what may be termed the "Predisposing causes."

In the wild and natural state abortion in cows is very rare except as the result of violence, and is seldom met with in the mountains and moors of Scotland and Wales. These facts seem to indicate some connection of the causation of abortion with artificial refinements of breeding, high feeding, and the general management under domestication. In some parts in-and-in breeding has been largely indulged in, and there can be no doubt that this practice has intensified constitutional infirmities and rendered cattle less able to combat various diseases when they present themselves, especially under such indifferent hygienic conditions in which some cattle have to spend a good portion of their existence. One eminent breeder of Shorthorns has stated that when he has got a section of his stock brought to a high pitch of perfection as regards feeding and milking properties, the animals are almost sure to stop breeding, either by not taking the bull or by aborting. The great predisposing cause to contagious abortion is the exposure to infection, and if any pregnant cow is inoculated with a sufficient quantity of the virus under almost any circumstances she will undoubtedly abort.

SPORADIC ABORTION. Exciting causes. The most common cause of sporadic abortion is "force" applied to the body of the pregnant cow. In the majority of cases this is due to accidental circumstances, although occasionally it is due to wilful brutality and sometimes to want of thought on the part of servants, as the untimely closure of gates and doors, kicks on the belly, &c. Other examples are crushing on going through doorways, bruising in passing through or over hedges, kicks sustained while pasturing with horses, and the butting of playful young stock. A bull being allowed to run with pregnant cows is an assigned cause, but a very doubtful one, although any forcible penetration of the genital passage is very conducive to dislodgement of the fœtus. Exploring the uterine orifice for the purpose of finding out whether the cow is pregnant or not has caused abortion, and a certain degree of risk is always involved in "punching" or "feeling" the calf from the flank. Fright and excitement are potent factors in producing miscarriage, as is shown sometimes by the effects of a thunderstorm, or the sudden intrusion of hounds amongst a herd of pregnant cattle. Galloping down steep hills and jumping down from elevated positions have also produced similar effects. Hœmorrhage sometimes proves inimical to fœtal life and leads to abortion by producing general debility and withdrawing the necessary blood supply from the womb. Food and water given *ad lib.* after long fasting and when the appetite is ravenous may produce abortion as the engorgement of the rumen may cause this organ to encroach on the pregnant uterus and disturb the placental circulation and so bring about a separation of the fœtal envelopes from the maternal organs, and a consequent premature expulsion of the fœtus. On the other hand insufficient food has very often proved fatal to fœtal life, the result being brought about by a weakened circulation on the part of the dam and a consequent impaired fœtal circulation as well as the want of nourishment. By some people undecorticated cotton cake is considered a fruitful cause of abortion. It has been suggested that this is due to poisonous seeds other than cotton seeds, but which have grown with them and have been included with them in the cake. Frozen herbage and roots, especially if damaged by decay, are fruitful causes of the mishap in question, and drinking highly contaminated sewage water sometimes has the same effect. Certain plants and medicinal agents have a decided action on the uterus and may cause expulsion of its contents. Of these, savin, rue, ergot of rye, and ergotised grasses are the most potent. There has been considerable discussion at different times as to whether ergot has any power to cause abortion or not, and I distinctly favour the view that it does. Ergot causes contraction of all involuntary muscle fibre, and in ergot poisoning we get dry gangrene of the extremities owing to the interference with the circulation caused by the contraction of the muscular coat of the arteries. In pregnant cows this same action is exerted on the vessels of the placenta with the result that the fœtus is actually starved and then it is aborted, the expulsion being assisted greatly by the contraction of the muscular coat of the uterine wall also set up by the ergot poisoning. The administration of drastic purgatives to a pregnant cow always entails a risk of abortion, and such medicines as digitalis, pot. nitrate, and common salt in large doses are said to have a similar effect. Cantharides applied to the skin as a blister has also been followed by abortion. This is due to the irritant effects of the cantharides on the urino-genital tract following its absorption from the skin. The presence of tumours in the uterus may cause premature expulsion of the fœtus. There is strong evidence that a bull enfeebled by too much use is very likely to be a cause of abortion in the females to which he has been put. In the course of various diseases associated with fever premature expulsion of the fœtus may occur, such as contagious bovine pleuro-pneumonia, foot-and-mouth disease, and any diseases of the alimentary tract causing straining. It has been suggested by some that cattle may abort from sympathy in the same way that some human beings are sick when they see another person sick. I have no faith in the sympathetic theory, and believe that instances quoted were cases of mistaken diagnosis and that they were examples of contagious abortion, the various animals having been infected about the same time.

Under some circumstances it may be necessary to produce artificial abortion, but in doing so there is always considerable danger of setting up metritis or inflammation of the womb. It may be brought about by repeated dilatations of the cervix uteri, or by puncturing the fœtal membranes, or by repeated irrigation of the vagina with cold water.

Epizoötic Abortion. Clater, one of the earliest writers, refers in 1786 to abortion as one of the curses of the breeder. He also remarks on the fact that this disease sometimes assumes an epizoötic character. Youatt, in 1834, notes the susceptibility of cows above that of other animals of the farm, and he mentions a case in which the circumstances suggested to him that the affection was of a contagious nature. From these instances it will be seen that the contagion theory is by no means modern. However, it was not until 1895 that contagion was definitely proved to the satisfaction of bacteriologists, and we are indebted to Dr. Bang, of the Copenhagen Veterinary College, for nearly all we know about it.

Etiology. The organism responsible for contagious abortion is a small bacillus, the longest specimen of which is about the size of Koch's bacillus of tuberculosis, viz., 3 to 4 μ.* It is non-motile. It will stain by the ordinary aniline dyes. It is found in the yellowish pus-like exudate in the uterus between the uterine wall and the fœtal membranes. It was this discharge that Bang discovered the organism, and from it he obtained a pure culture.

In 1885, Nocard had been conducting research on the same subject, and he described the same bacillus or one very much like it. He found it amongst a lot of micro-cocci, but as he did not isolate it and produce abortion by it, he could not assert definitely that *it* was the cause of abortion any more than the micro-cocci he found with it. The presence of these micro-cocci, Bang explains, was due to the fact that Nocard did not examine the discharge until several hours after the expulsion of the fœtus.

Bang conducted his research on the intact pregnant uterus of a cow that had shown signs of aborting. This cow was taken from a herd in which the disease was known to exist, and was killed for the purpose. In this way he obtained the uterine exudate uncontaminated with adventitious organisms, and in it he found the before-mentioned bacillus in pure growth. After some little difficulties he succeeded in making artificial cultures of the bacillus, and with them he experimentally produced abortion, thus proving definitely that the organism he had discovered was the true cause of abortion. He experimentally inoculated in three different ways, viz., intra-vaginally, hypodermically, and intravenously, and in each case abortion resulted with exactly similar lesions to those in naturally occurring cases.

---

* μ is the symbol for micro-millimetre, which is the usual standard for measurement of bacteria. It is $\frac{1}{1000}$ of a millimetre, i.e., $\frac{1}{25000}$ of an inch.

The organism is best cultivated artificially in a mixture of gelatine agar and blood serum. The seed material is mixed with the medium while liquid, and then it is allowed to solidify. The growth in this medium is very characteristic. It commences about $\frac{1}{5}$ inch below the surface, and takes place through a zone from $\frac{2}{5}$ to $\frac{3}{5}$ inch thick. It will also grow in glycerine bouillon in the form of a fine precipitate, consisting of small whitish granules made up of bacilli. The behaviour of the bacillus in the presence of oxygen is very peculiar. As its growth in serum-agar indicates, it flourishes in a nutritive medium with a degree of tension of oxygen somewhat less than that of the atmosphere. It also flourishes in a nutritive medium with the oxygen tension very high, but somewhat under 100 %. Between these two degrees of oxygen tension there is an intermediate zone, in which the abortion bacillus grows badly or not at all. The ordinary atmospheric tension of oxygen is included in this intermediate zone.

The vitality of the organism is very great, and it will live within or outside the uterus for at least seven months.

The period of incubation varies. On intra-vaginal inoculation of the pure culture, Bang found it to average about ten weeks. In England, however, the intra-vaginal inoculation with discharge from an affected cow has produced abortion at periods varying from 9 days to 21 days in some instances, and in other instances at periods varying from 5 to 10 weeks. In naturally occurring cases the period in the majority is probably longer.

The lesions in contagious abortion consist of a catarrhal inflammation of the womb with exudate between the uterine mucous membrane and the fœtal envelopes. There is marked œdema of the subchorial connective tissue, making the afterbirth slimy and gelatinous. On account of this the removal of a retained cleansing is difficult, owing to the ease with which the membranes tear. A few bacilli have been found in the heart blood of the fœtus, and also in the intestine, shewing that the fœtus itself may become infested.

The history of an outbreak of contagious abortion is usually "the introduction of a new cow," or "the use of a particular bull." The disease is spread from cow to cow, probably by the vulva of a healthy cow being directly inoculated by coming into contact with discharge from an affected cow while lying down, or by the whisking of the tails. It is also probable that it may in some cases be introduced by inhalation or ingestion of the bacilli. Bang has experimentally induced abortion by intravenous injection of pure cultures, and by intravaginal inoculation of them in cows, ewes, and a mare. It is, however, not certain that the epizoötic abortion occasionally seen among mares and ewes is due to the same organism. Attendants may transfer the virus from the diseased to the healthy, and undoubtedy the bull is sometimes responsible after having served a cow that has recently aborted.

The virulence of contagious abortion diminishes after the disease has existed for a time. This may be due to one of two causes, or possibly to a combination of the two: 1st, The animals may have acquired a certain degree of immunity; or 2nd, The virus may have become attenuated somewhat. In any case it is not customary for a cow to keep on aborting for more than three or four years. At each succeeding pregnancy the calf is carried a longer period, so that if no new cows are imported into the herd, the disease tends to die out in about five years without any treatment.

Symptoms of abortion. If the embryo is expelled before the eighth or tenth week, it is often done so unobserved, and it is not until œstrum has returned that the cow is suspected of having aborted. In cases at later periods of gestation, the symptoms may be well marked and may be accompanied by all the usual phenomena of parturition. There is loss of appetite and dulness, and if at grass the cow tends to isolate herself and now and then emits a plaintive moan. Later on there appears to be more or less excitement; the pulse and respiration become more frequent than normal, and there is often a little fever and shivering. The mammary glands enlarge, milk being formed, and this may precede the expulsion of the fœtus by three or four days, or even a week. The ligaments on either side of the tail become relaxed and the labia of the vulva become swollen and œdematous. This relaxation is more noted in the more advanced stages of gestation. If the fœtus has been injured by violence there will be signs of greater abdominal pain than otherwise. If caused by ergot poisoning there is contraction of the pupil, diarrhœa, and sometimes epileptiform convulsions. The above symptoms are followed sooner or later by more active phenomena corresponding with those of normal parturition. In contagious abortion the fœtus is immediately followed by a dirty yellow rather thin odourless exudate from the uterus. In some cases the escape of some of this fluid precedes the dislodgement of the embryo. This discharge is easily distinguished from that which constantly sets in as the result of a retained afterbirth. The latter discharge does not set in immediately, and when it does it is invariably putrid.

Treatment. Isolate the cow as soon as symptoms appear. If the symptoms are noticed in good time the accident may be checked or prevented by the administration of narcotics, provided the fœtus is still alive and the membranes not ruptured. The cow should be kept perfectly quiet in a dark box, and opium, or chloral hydrate, or chloroform given. Saint-Cyr recommends one to two drachms of laudanum every hour administered in very small enemata, not more than a wineglassful at once. He thinks it preferable to draughts which may, however, be used concurrently. Another authority prefers chloroform in doses of three drachms given in the form of a draught in oil or mucilage, repeating every hour. If the animal will eat and drink, easily digested food in small quantity, and gruel may be given until the danger is passed, about one or two days. This treatment is applicable to sporadic abortion, but only delays the evil hour in the contagious form. In ergotism, the cause must be removed and tonics given. When the abortion is inevitable, as indicated by the rupture of the water bag, the object must then be to favour the expulsion of the fœtus, but active intervention is only to be recommended when the labour is tedious. If the fœtal membranes are retained they should be removed as soon as possible, and in any case the uterus should be well washed out with some dilute antiseptic solution by the aid of a Reed's pump. A solution of carbolic acid 1 % in water about blood heat is a simple and efficient injection. Another good injection consists of :—

Corrosive sublimate ...	1 part.
Common salt	40 parts.
Soft water	4000 ,,

The vulva, tail, and the thighs should be sponged daily with disinfectants, such as 4 or 5 % aqueous solution of carbolic acid. Another disinfectant recommended for external application consists of :—

Corrosive sublimate ...	2½ drachms.
Hydrochloric acid (dilute)	2½ ounces.
Soft water	2 gallons.

The strength of the corrosive sublimate in this is approximately 1 in 1,000. Nocard recommends a solution of copper sulphate.

In all cases of abortion, unless it can be definitely proved to be otherwise, the treatment should be as for the contagious form in order to be on the safe side. The diet must be a nutritious one, and the cow must not be readmitted to the byre until all discharge has completely stopped. The fœtus and cleansing should be deeply buried or preferably burned. The person attending the affected cow must not be admitted to the byre nor be allowed to attend any pregnant animals. If the accident has happened while at pasture the turf on which the fœtus or the cleansing was found should be buried with the fœtus and replaced by fresh sward. The whole pasture may be contaminated by the uterine discharges and therefore the whole stock should be removed as soon as possible, and if practicable the pasture be left vacant for several months and dressed with lime owing to the great vitality of the abortion bacillus. An aborted cow should not be put to the bull within three months, and not then unless she is perfectly free from discharge and has undergone a thorough course of disinfection. It is advisable where practicable not to use the same bull for this cow as for the general stock, but if that is unavoidable, his prepuce should be well syringed out several times with one of the previously mentioned disinfectants. If a lot of cows have aborted then isolation cannot be practised. Under these circumstances any discharge from affected animals should be prevented from getting near healthy animals either by the gutter, utensils, or any other medium. The affected animals should be treated just as recommended under isolation, and the external genital parts and their neighbourhood of all healthy in-contact animals should be regularly disinfected. Wash the floor well and disinfect the whole building thoroughly. A good disinfectant for the floor is powdered quick-lime, as it kills the bacteria and does not interfere with the utility of the manure as do most other disinfectants. The bull must be disinfected after every service, both as regards prepuce, nose, breast, and abdomen.

I cannot emphasize too strongly the importance of paying strict attention to detail in disinfecting. If that is well practised, internal treatment is unnecessary. However, the following has been recommended: Half-an-ounce of crude carbolic acid every other day for a week, then once a week for a month, to be repeated once a month for some time. Objection is made to this on the ground that it taints the milk. If any medicine is required, sulphate of magnesia or hyposulphite of soda in three ounce doses once daily in the food is about the best.

If the cow is not well attended to, it is always possible or even probable that she will abort a second time and perhaps a third time, and although the disease tends to exhaust itself in time, this method of procedure would entail a very great loss to the breeder. When the outbreak is not general throughout the herd, it is not advisable to put the aborted cow to the bull again, and she should be fed for the butcher unless *very* valuable for breeding purposes. Her milk wouldn't pay for keep, and moreover she would be a danger to the rest of the stock. Sending such an animal to an auction as a milker would be a crime of the deepest dye, involving the risk, as it does, of introducing the disease into another herd.

When a herd is free from the disease, I should advise that all new cows should be put into a shed and kept apart from the main stock until they have calved, and proved themselves free from the disease. Great care should be exercised in the purchase of a new bull, which should not come from an infected stock. In any case, new bulls should be well syringed out at the prepuce with disinfectants before being used for service.

OBITUARY.

Stephen Frederick Wombwell, Captain in 3rd Battalion Imperial Yeomanry, died on February 1st from enteric fever in South Africa. He was the only surviving son of Sir George Wombwell, Bart., of Newburgh Priory, Yorkshire. He was a student at the R.A.C. in 1884, and afterwards went to Trinity Hall, Cambridge, and graduated B.A. in 1892. He had held a commission in the Yorkshire Hussars Yeomanry Cavalry since November, 1892, and had been serving with the Imperial Yeomanry since February, 1900. He was a J.P. for the North Riding of Yorkshire.

We deeply regret to record the death of James John Forrester, M.R.A.C. (1893). He was a distinguished student, and passed out as Ducie Gold Medallist: he was in the Cricket XI. and the Football XV. He also obtained, by examination, the first-class certificates or diplomas of both the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland. At the examination of the R.A.S.E., he obtained record marks in Agriculture and First prize. Mr. Forrester has since 1897 held the post of Manager of the Royal Agricultural Society's Experimental Farm at Woburn; he obtained leave to volunteer for service in the war in South Africa, and joined the Imperial Yeomanry—Paget's Horse—in February, 1900; he was a corporal at the time of his death, which occurred at Lichtenburg on March 13th, the result of wounds. Ætat. 29. From a letter written by him to his mother on February 25th, we learn that he was playing cricket against the Northumberland Fusiliers a few days earlier, and took four wickets for 16 runs, and made five not out: also they had played the Fusiliers at football. Forrester's life was full of promise, and his many friends grieve that it was ended so early and so suddenly.

AYNSOME EXPERIMENT STATION, LANCASHIRE.

This Agricultural Experimental Station is being started by Mr. John Stewart Remington, M.R.A.C. (1896). Preliminary experiments on a small scale have been in progress at Aynsome Farm for the last two years, all the necessary chemical work and analyses being undertaken at the Laboratory in Lancaster. It has, however, been found most inconvenient to have everything brought over or sent a matter of twenty miles by train, and through various family changes it was decided last autumn to build a complete experiment station on the Aynsome Estate, near the Home Farm, and close to Aynsome House, the residence of the Remington family for the last two hundred years. The Home Farm is partly situated on mountain limestone and partly on gravel and sandy shales, being three miles from Cark-in-Cashmel station on the Furness Railway, and also at the same distance from the small town of Grange-over-Sands.

The new buildings will consist of a chemical laboratory from designs by Messrs. Austin and Paley. The large laboratory for general work will be 40 feet long by 30 feet wide. There will be a smaller laboratory which will be devoted to water analysis, microscopic work, and investigations in plant physiology. There will also be a room 10 feet by 16 feet, which will be fitted up to receive the chemical balances, and to act as a calculation room and library. All the rooms will lead out of the large laboratory, which has been designed to accommodate eight workers. The laboratory will be furnished with all apparatus necessary for any analysis and research work in organic and agricultural chemistry; and in this respect no expense has been spared in order to make everything as complete as possible. At the Farm itself there is going to be built during the year a model dairy in which every point will be studied in order to insure the most perfect conditions possible for the production of a high-class butter. There will also be a feeding house, with four stalls and fodder room attached, on the lines of the Möckem digestion and feeding houses, for experiments on sheep and bullocks.

The laboratory and experiments will be under the management of Mr. J. S. Remington, who will be assisted in this work by his brother-in-law, Mr. T. M. Remington, and Mr. Claude Smith. About 15 acres of the Home Farm will be devoted to plot experiments. The farm will be entirely under the management of Mr. T. M. Remington, who up to the present has been a very successful farmer in the North of England. As the carrying out and maintaining of a private station of this kind involves a large outlay as well as a considerable yearly expense, it is intended to receive pupils (out) either for training in agricultural chemistry or research or for farming only.

It is hoped that the laboratory and other buildings will be complete some time during the coming autumn, and that the new experiment station will be in full working order by the summer of 1902.

In the work of agricultural-chemical research the advice and help of Professor R. Warington, F.R.S., will be appreciated : researches in vegetable physiology will be chiefly through the advice of Mr. C. F. Cross, F.I.C.

AGRICULTURE IN THE SUDAN.

G. H. Nevile, M.R.A.C., writing from Berber, Sudan, Egypt, to the Professor of Chemistry, says : "The other day, looking over some land for sale by Government, I came across a bed of what I take to be nitrate which the natives were using as manure. I was perfectly astonished at their knowledge of the subject. I questioned them about it, and they said they applied it in two or three top dressings when the plants were some six inches high in the first case. They said it gave best results with wheat and millet and that they did not use it for their beans and leguminous plants. They accounted for its presence by saying animals had stood there 20-30 years ago. It was a regular lesson in agricultural chemistry from people who had never heard of nitrates, &c. The only defect of their mode of cultivation was that they applied the nitrate year after year, and never ploughed nor worked the ground properly to give the other foods a chance.'

STUDENTS' GAZETTE.

During the past year complete sets of the *Gazette*, 2nd series, have been presented to the Board of Agriculture, England ; the Board of Agriculture, Ireland ; the Surveyors' Institution ; and the Farmers' Club, London.

Complete sets have been purchased by the British South African Company, V. D. Stenhouse, and H. Blaauw.

Only four complete sets remain on hand.

AT THE FRONT.

H. Ellershaw, Second Lieutenant, 3rd Battalion, The Queen's Royal West Surrey Regiment.

H. Miers, Second South Wales Borderers Militia.

S. F. Wombwell, Captain, 3rd Battalion Imperial Yeomanry. *Obiit* February 1st.

Glendower Allen, Compton's Horse, has received a commission in the Imperial Yeomanry.

OLD STUDENTS.

Mr. J. D. Whittaker, M.R.A.C., Gold Medallist (1893), has been appointed Resident Sub-agent on the Estate of Sir Weetman D. Pearson, Bart., M.P., at Paddockhurst, Worth, near Dover.

Mr. W. T. A. Edwards, M.R.A.C. (1891), F.I.C., has passed an examination at the Pasteur Institute, Paris, and obtained the Diploma of "Chimiste-analyste de l'Institut Pasteur de Paris."

CHLORINE IN RAIN WATER.

The rainfall for the six months ending March 31st was 15·32 inches, falling on 104 days; it contained on the average chlorides equivalent to ·396 grains of sodium chloride per gallon, equal to a deposit of 19·6 lbs. of common salt per acre. For the twelve months ending at the same date, the rainfall was 24·79 inches on 177 days, and containing chlorides equal to 28·12 lbs. of common salt per acre. E. K.

DIPLOMA EXAMINATION.

Last term, Christmas, 1900, the Diploma of Membership was taken by Mr. James Foyster Bell, Mr. William Ingleby Fosbery, and Mr. Lakshmi Claud Sharma. Mr. Bell obtained the Haygarth Gold Medal. The external examiners were, in Agriculture, Mr. W. C. Brown; in Agricultural Chemistry, Dr. J. A. Voelcker; in Veterinary, Prof. Sir G. T. Brown, C.B.; and in Practical Engineering, Professor H. Robinson.

SCHOLARSHIPS.

The First and Second Scholarships last term were divided between H. B. Beddall and Sheikh M. Husain, and the Third was won by G. A. Lambert.

SURVEYORS' INSTITUTION.

P. H. Kingsford (R.A.C., 1894) has been elected a Fellow of the Surveyors' Institution.

FOOTBALL.

RUGBY.

CHARACTERS OF THE XV.

†*H. A. BONNIN.—Has only played once this session. A very fast three-quarter.

†*E. M. WASON.—One of our best forwards, plays up hard, and is always on the ball.

†*E. WALFORD.—Has been the mainstay of the three-quarter line; has much improved his tackling.

†*S. HANCOCK.—Very smart wing three-quarter; tackles and kicks well.

†*H. B. BEDDALL.—Captain. The best forward in the team; keen, and very hard-working. Has made an invaluable captain during the seasons 1900 and 1901.

*R. H. KEANE.—A very powerful forward; has played hard this session.

*G. J. WILSON.—Has played half lately; should pass out more quickly; kicks well.

*R. C. BARTON.—Very plucky half; tackles well and passes straight.

*H. CREWDSON.—Only played once this session. Is an excellent forward when in condition.

*G. A. LAMBERT.—Very energetic forward; works hard in the scrum.

*A. GAWTHROPP.—A heavy forward; works hard in the scrum; rather clumsy with his feet in the open.

*G. S. BISDEE.—Has played forward and three-quarter, more successful in the latter position. Must learn not to lose his head.

*S. BURRELL.—A very useful forward; knows the game well.

*P. J. LINDSELL.—Has been fairly successful at centre three-quarter. Must learn to look where he is passing; takes his passes well and runs straight.

M. F. IRWIN.—Has played full back twice. Kicks well; should be good with practice.

F. W. DAVIES.—A thick-set forward. Has played twice; does not work hard enough.

F. WHITEHEAD.—Has played full-back and three-quarter, but has not been a success in either position.

† 1899—1900 colours. * 1900—1901 colours.

R.A.C. v. ST. PAUL'S COLLEGE, CHELTENHAM.—This match was arranged in consequence of the Barnwood fixture being scratched, and played on the College ground on March 2nd. The St. Paul's team was fairly strong, and in the first half of the game pressed the College hard, and got over twice, one try being converted. In the latter half, however, the College got to work, and Wilson scored a smart try, which Keane failed to convert. The weather at the end became so bad that the referee stopped the game. The College men were somewhat out of practice, and in consequence the combination was not good. Hancock, as usual, brought off some smart tackles, and Barton at half played hard. Team:—F. Whitehead, back; Bonnin, Walford, Lindsell, Hancock, three-quarters; Barton and Wilson, halves; Beddall, Wason, Keane, Crewdson, Gawthropp, Lambert, Burrell, and Bisdee, forwards.

R.A.C. v. MAGDALEN COLLEGE, OXFORD.—Played at Oxford on Wednesday, March 6th. In spite of the bad weather in the preceding week, the ground was in excellent condition. As usual, the Magdalen pack was very heavy, and the College forwards had a hard game. Soon after the start the Magdalen three-quarters ran over twice, neither try being converted. After a time, however, the College played up better. Bisdee at three-quarter tackled very well indeed, and Lindsell put in some useful play. After half-time the game was very even, and it was not until quite the end that the Magdalen men again scored. The College forwards played well, and had hard luck in not scoring; once they actually did get over, but the referee ruled it to five yards. Wason for the College played an excellent game. Irwin, who had filled a vacancy at full back, put in some useful kicks. Team:—Irwin, back; Bisdee, Walford, Lindsell, Hancock, three-quarters; Barton and Wilson, halves; Beddall, Wason, Keane, Gawthropp, Lambert, Burrell, Davies, forwards.

R.A.C. v. CHELTENHAM A.—Played at Cheltenham on Saturday, March 16th. This was a very even game, and ended in a draw of one try each. The weather was very fine and the ground in good order. The College lost the toss and kicked off. After a lot of hard forward play, in which Keane and Wason showed to advantage, Barton started a round of passing, which resulted in Hancock running over; Beddall failed at goal. After half-time the Cheltenham men played very hard, and at length scored an unconverted try. Hancock was in his best form, and kicked very smartly. Barton and Wilson at half got on well; the former tackled very smartly. Lindsell and Walford were very good at centre three-quarter. Team:—Irwin, back; Hancock, Walford, Lindsell, Whitehead, three-quarters; Barton and Wilson, halves: Beddall, Keane, Wason, Gawthropp, Lambert, Burrell, Bisdee, Davies, forwards.

ASSOCIATION.

CHARACTERS OF THE XI.

IRWIN.—Goal. Very cool and steady and clears well. With practice should become very useful.

PROFESSOR WOOLDRIDGE.—Back. Has on every occasion played splendidly. Kicks and heads well, and invariably stops his man by his fine tackling.

BEDDALL.—Back. Goes in hard for his man and is a steady safe back.

WALLIS-WILSON.—Right-half. Sticks well to his outside and knows how to feed his forwards.

BLOIS.—Centre-half. Tackles brilliantly and is a strong, hard shot.

GAWTHROPP.—Left-half. A hard-working half, with plenty of weight and judgment.

DARLING.—Has played outside and inside. Plays a hard game, but like most of the forwards fails in front of his opponents' goal.

WRIGHT.—Inside right. Passes well and can dribble.

HERVEY.—Centre. Lacks combination and fails in front of goal.

WALFORD.—Inside left. Very good on occasions. Has plenty of weight, but does not combine quite enough.

BONNIN.—Outside left. Is a fast outside and passes in well.

R.A.C. v. CHELTENHAM TOWN.—Played at Cheltenham, February 13th. The ground was very greasy on the surface, while frost had made it hard underneath, which perhaps had something to do with the College's poor display, while we sadly missed Theo. Fowler's services in the defence. On starting Cheltenham at once got away and pressing hard scored two goals in the first ten minutes, before half-time Moorhouse added a third goal. On resuming the College got two corners but failed to score, and Cheltenham rushing the ball down scored again through Heppel. The College forwards made several individual attempts to score, but were unable to, and Heppel added one more goal against us before time. Result: Cheltenham 5, College 0. Team: Sawyer; Prof. Wooldridge, Beddall; Gawthropp, Blois, Wallis-Wilson; Bonnin, Walford, Hervey, Darling, Salvago.

R.A.C. v. DEAN CLOSE SCHOOL.—On Wednesday, February 27th, the College played Dean Close School at Cheltenham. Recent rain had made the ground rather wet, and consequently the ball greasy, but a very well contested game ended in a win for the College by 2 goals to *nil*.

R.A.C. v. Cirencester Town.—Played in the Park on Thursday, February 28th. The Town started with the wind, and attacking strongly Boulton scored in the first ten minutes. The Town again pressed and another goal was added from a melée in front of goal. After this the College got together a little, and for a short time pressed vigorously, but were unable to score, and half-time arrived with the score 2-0 against us. With the wind at their backs the College had most of the game and Walford scored from a good shot, but we were unable to draw level, and Crabb getting down the wing centred excellently to Wright, who scored a third goal. Result: Town 3, College 1. Blois at half and Wooldridge at back were both in splendid form, and Walford was conspicuous in the forward line. Team: Sawyer; Beddall, Prof. Wooldridge; Gawthropp, Blois, Wallis-Wilson; Salvago, Darling, Hervey, Walford, Bonnin.

R.A.C. v. Cirencester Town.—Neither the College nor the Town having a match on, an extra match was arranged between them on March 9th, in the Park, and resulted in a win for the Town by 4 goals to *nil*. The Town soon pressed, and Irwin stopped in turn hot shots from Boulton and Sewell. Jackman scored the Town's first goal from a free kick. After this Darling and Hervey broke away, but Spencer prevented scoring, and Fowler working down put in a good shot, but Irwin cleared safely, and though Boulton, Sewell, and Crabb each in turn tried to score, Irwin was equal to the occasion, and nothing more was registered against us before half-time. On resuming Arnold got away and centred to Crabb, who scored the second goal for the Town. Blois then dribbled down the field, but Spencer saved a good shot, and our forwards though getting close up to the Town goal found Allen, Jackman, and Spencer impregnable; and the Town added two more goals through Boulton and Crabb. The College would have been much more badly beaten but for the coolness of Irwin in goal and the splendid tackling and kicking of Prof. Wooldridge at back. Team: Irwin; Prof. Wooldridge, Farwell; Thompson, Blois, Gawthropp; Bonnin, Walford, Hervey, Darling, Salvago.

R.A.C. v. Roseleigh.—On March 20th, the College were at home to Roseleigh. A very high wind very much spoilt the game. In the first half Wallis-Wilson scored for us by a long shot, and the College were unlucky in not scoring more, as the ball rebounded once off the side post and once off the cross-bar. They equalized in the second half, leaving the result a draw of one goal all

The 2nd XI. played two matches, drawing with the Town 2nd 2 goals all, and beating Dean Close 2nd by 3 goals to 2.

The match with Wycliffe was abandoned owing to the weather, and with Swindon Amateurs owing to inability on our part to raise a team.

BILLIARDS.

An American Tournament Handicap, 200 up, was played off during the term between the following Competitors:—

	Hcp.		Hcp.		Hcp.
Prof. Paton	scratch	Thompson	35	Walford	50
Aspinall	10	Wilson	35	Lindsell	50
Gawthropp	10	Irwin	35	Keane	60
Sawyer	15	Bateman	35	Gruning	70
Blois	15	Burrell	40	Hartley	70
Hancock	30	Rowe	40	Whitehead	75
Prof. Locke	35	Bisdee	45	Prof. Wooldridge	80
Prof. West	35	Smith	45	Basalgette	90
Salvago	35	Farwell	50		

The prizes went to 1, Blois; 2, Prof. Locke; 3, Lindsell.

CRICKET.

FIRST XI. FIXTURES.

Date.	Match.	Played at
Saturday, June 1	XI. v. The Rest	Home
Wednesday, ,, 5	Stroud C. C.	Stroud
Saturday, ,, 8	Tetbury C. C.	Home
Wednesday, ,, 13	Cheltenham Town C. C.	Cheltenham
Saturday, ,, 15	Swindon Town C. C.	Home
Wednesday, ,, 19	Gloucester C. C.	Gloucester
Saturday, ,, 22	Stroud C. C.	Home
Wednesday, ,, 26	Cheltenham College	Cheltenham
Saturday, ,, 29	Tetbury C. C.	Tetbury
Wednesday, July 3	East Gloucestershire C. C.	Cheltenham
Saturday, ,, 6	Cirencester Town C. C.	Cirencester Park
Wednesday, ,, 10	E. T. Cripps' XI.	Ampney Crucis
Saturday, ,, 13	Swindon Town C. C.	Swindon
Wednesday, ,, 17	Gloucester C. C.	Home
Saturday, ,, 20	East Gloucestershire C. C.	Home
Wednesday, ,, 23 Thursday, ,, 24	Past v. Present	Home
Saturday, ,, 27		
Wednesday, ,, 31	Cheltenham Town C. C.	Home
Saturday, Aug. 3	Cirencester Town C. C.	Home

V. D. STENHOUSE, Captain.

Eight matches have been fixed for the Second Eleven.

R.A.C. GOLF CLUB.

Two matches were played this term, one v. Marlborough and one v. Sapperton. The results were as follows :—

R.A.C.G.C.		v.	MARLBOROUGH.	
C. O. H. Sewell	2		Mr. H. H. Marriott	0
E. B. Haygarth	0		Mr. R. G. Durrant	4
Prof. Paton	0		Mr. A. S. Eve	2
E. C. T. Dodd	0		Rev. C. H. T. Wood	0
H. St. G. Rawlins	0		Mr. G. H. Hughes	7
Prof. Blundell	0		Rev. C. Thorpe	0
S. M. Sawyer	0		Mr. J. P. Prior	1
H. Patten	5		Mr. C. A. Emery	0
	7			14

R.A.C.G.C.		v.	SAPPERTON.	
E. B. Haygarth	0		C. O. H. Sewell	4
Prof. Paton	0		J. Rawlins	3
Prof. Blundell	4		E. C. Cripps	0
Sawyer	0		E. C. T. Dodd	0
Patten	0		H. St. G. Rawlins	5
Eddison	0		C. W. Firebrace	11
Thompson	0		R. J. Mullings	3
	4			26

The Cups were played for on March 24th. The Senior Cup was won by Eddison with a return of 96 – 12 = 84, Professor Paton being second with a good score of 85 (scratch). The Junior Cup was won by Prof. West. The following were the returns :—

Senior Cup.			
Eddison	96	– 12	= 84
Prof. Paton	85	Scr.	85
W. Thompson	98	– 12	= 86
Sawyer	100	– 6	= 94
Gawthropp	104	– 10	= 94
Darling	110	– 16	= 94
Prof. Blundell	117	– 6	= 111

(No returns from Prof. Locke, Tunstall, and Patten.)

Junior Cup.			
Prof. West	107	– 20	= 87
Irwin	107	– 18	= 89
Sandford	108	– 17	= 91
Prof. Wooldridge	113	– 20	= 93
Stuart	113	– 20	= 93
W. W. Thompson	112	– 18	= 94

(No returns from Rowe and Pennington.)

The match against the Common Room of Marlborough College was most interesting, all our men being in excellent form. Messrs. Sewell, Rawlins, and Dodd kindly played for us on this occasion.

REVIEWS.

Eleanor A. Ormerod, LL.D., Report of Injurious Insects and Common Farm Pests during the Year 1900. London, Simpkin, Marshall, Hamilton, Kent, & Co. 1901. pp. ix. and 111. 1/6.

The latest report published by Miss Ormerod on injurious insects, etc., indicates that during the year 1900 no very serious infestations were prevalent throughout the country, although certain local areas were more or less troubled with insect pests. Perhaps the most interesting part of the report is that referring to the Bean and Pea-seed Beetles (of the genus *Bruchus*), Coleoptera of Asiatic origin, of which several additional species have recently been introduced into the country. Some important points are also brought forward in connection with the Greater Ash-Bark Beetle *(Hylesinus crenatus)*, and the Wheat Bulb Fly *(Hylemia coarctata)*, and a note on the peculiar tropical land-planarian, *Bipalium Kewense*, is also of interest. It is with regret that we have to notice that this is the last report that will be issued by Miss Ormerod, and all those who can appreciate the time and labour expended on the publication of such an important series of Annual Reports as those issued by Miss Ormerod since 1877, will feel that their discontinuance is a serious loss. Nowhere will this loss be felt more than at the R.A.C., Cirencester, which in many ways in the past has had the direct benefit of Miss Ormerod's energy and experience. Miss Ormerod was a special lecturer at the R.A.C. during 1882 and the two following years, and has often contributed to our pages ; among her contributions are the following :

The Gooseberry Caterpillar, New Series, Vol. I., p. 35.
Coffee Grub in Ceylon, N.S., Vol. I., p. 69.
On the Presence of Grubs and Maggots of Injurious Insects in Farm Manure, N.S., Vol. I., p. 168.
The Turnip Mud Beetle, N.S., Vol. VII., p. 37.
From Herons to Watercresses, N.S., Vol. VII., p. 218.

Her late sister and herself made some valuable contributions to our Museum. To the Agricultural and Horticultural community the generous and self-imposed labours of Miss Ormerod, involving as they did an enormous correspondence day after day for well nigh a quarter of a century, have been of inestimable benefit. Her persistent inquiries year after year into the causes of injuries to crops and her continuous endeavour to find means of cure or abatement of the nuisance have, in addition to the direct benefit conferred, called attention to the importance of agricultural entomology, and stimulated its growth in other directions. Miss Ormerod has given generously, lavishly, of her time, her talents, and her means, towards increasing our knowledge of injurious insects, and she has met with some reward. Her name is known and honoured not only in England, but throughout the British Empire and in foreign countries, Universities and Societies have delighted to do her honour ; and now that she deems it expedient to no longer work at such high pressure, we are sure that a large army who have benefited by her work, including many friends connected with the R.A.C., will unite in the hope that she may be able for a long time to enjoy her thoroughly well-earned comparative leisure and rest.

F. G. TAIT. A RECORD : BEING HIS LIFE, LETTERS, AND GOLFING DIARY. By John L. Low. With an introduction by Andrew Lang. London : J. Nisbet & Co. [1901.] pp. 304. 5s. net.

This interesting work, with suitable illustrations, is from the graceful pen of our esteemed Old Student, Mr. J. L. Low, and contains the life, letters, and golfing diary of that wonderful golfer and gallant young soldier, the late Lieutenant F. G. Tait, of the Black Watch, who was killed in action at Koodoosberg, on the Modder River, 7th February, 1900, aged 27. This book will be read chiefly by golfers, but even to those who care nothing for the Royal and ancient game there is much to attract. During his life, "Freddie Tait," by which name he was best known, by simple manliness of character, and a genuine and cheery disposition, had influenced many, and left behind him a host of friends in every rank of life. We believe that amongst that large circle of friends there was no one who was on more intimate terms with him, and who appreciated more thoroughly his worth, than the author of the work now under notice. Mr. Low has with great care and in perfect order recorded many interesting incidents in this short, but eventful life, and we most heartily congratulate him upon the result of his efforts, and trust that there will be a large sale of the book, the profits of which will be devoted to the Black Watch Widows and Orphans Fund. The Author will, we trust, pardon one criticism, which naturally arises to us. On hearing of a book by Mr. J. L. Low, we expected to find the quotation of much poetry, and that such poetry would teem with expressions wholly unintelligible to the Southron, and that we should have been able to say at once in each instance "Bobbie Burns" with the tone of one who knew that poet from cover to cover. But no. Truly there are some stanzas of charming verse in several parts of the book, but, alas, we can understand every word, and cannot as we hoped make use of the authoritative statement of reference to the Highland Bard.

JOURNAL OF THE DEPARTMENT OF AGRICULTURE OF WESTERN AUSTRALIA. Vol. 2, Parts 5 and 6 ; Vol. 3, Part 1. Perth, W. Australia, 1900, 1901.

If the report is correct that a large tract of fertile country has just been discovered near Tarcoola, with an ample water supply and probable freedom from drought, doubtless fresh attention will be drawn to colonising prospects in W. Australia. To anyone with such intentions these local journals should be invaluable, since adaptation or indifference to local conditions means everywhere success or failure. In the present series we notice some excellent papers on sheep, chiefly as mutton producers, pointing out the superiority of different breeds under varying conditions of soil and climate. Minor industries, as bee-keeping, pigs, poultry, &c , are treated of and incidentally show the value of an income drawn from as many sources as possible. The series on fruit farming by Mr. Despeissis, M.R.A.C., should be of great value, even to English growers : fruit and wine being looked on by authorities as products with a future. Another article of interest is a plea for a fixed type of heavy horse for the colony, giving suggestions as to importation on the basis of the Queen's Premium horses in England till a suitable type has been fixed, though it is well said that time is necessary for this —an idea we would endeavour to press on those who urge the prompt use of the half-bred hunter sire. L.

THE VETERINARY MANUAL. By F. T. Barton, M.R.C.V.S. London, Everett and Co. 1901. pp. 505.

This is a very useful handbook for agriculturists and horse owners ; and although it deals with the horse in particular yet it is useful in cattle management since with very few exceptions what is applicable to the former is applicable to the latter. It has been carefully arranged alphabetically so that reference is considerably facilitated. Particular attention has been paid to the practical side of the question, while a little theory has been introduced in places to make the practice more easily understood. For example, take the chapter on shoeing. The true object of shoeing is to apply some hard wearing material to the foot, which, while affording protection, shall also interfere as little as possible with the natural conditions. In order to accomplish this some knowledge of the anatomy and physiology of the foot is necessary, and this point is not overlooked when the author deals with the subject. The book is not intended to make every man his own veterinary surgeon, but treats of those very important subjects, namely Hygiene and first-aid. Take for example colic. This is a serious complaint which requires immediate attention, and the veterinarian may not be immediately available. The author tells you how to proceed, and gives some very useful prescriptions. You then have the satisfaction of knowing that the correct thing has been done, and moreover, a point of extreme importance, when the veterinary surgeon arrives you can tell him exactly what remedies have been applied and he will know how to proceed. The administration of patent "cure-alls" is to be strongly deprecated since the contents are unknown and their admixture with other remedies may prove anything but beneficial. A complaint common to horses and cattle is bronchitis, and the treatment for one will apply to the other. This subject is dealt with, like many others, in a masterly manner, not omitting that most important branch of treatment, namely hygienic measures and nursing. The author has omitted technical terms so far as possible, but one point certainly strikes discord. Surely every person knows what a " post mortem " examination is. Then why call it by that most awkward-sounding title "an after-death examination "? Surely that is overstepping the mark. We don't know of any other hand-book giving, as this does, a summary of veterinary matters which should be known to all agriculturists and horse owners, and on that account in conjunction with the way in which the subject has been treated, we have no hesitation in recommending it to all who have at heart the proper care of domestic animals in their charge.

CHESHIRE COUNTY COUNCIL AGRICULTURAL AND HORTICULTURAL SCHOOL. [Holmes Chapel.] EXPERIMENTS CARRIED OUT WITH MANGELS AND SWEDES DURING THE YEAR 1900. By E. Druce, M.R.A.C. pp. 7. Eardley, Crewe.

These experiments were made with 25 strains of mangels all manured alike, with 20 tons of farmyard manure, 3 cwt. superphosphate, ½ cwt. ammonium sulphate and a top dressing, after singling, of 1 cwt. sodium nitrate and 2 cwt. common salt. The yields varied from 28 tons to 47 tons per acre. Some varieties showed a much greater tendency to run to seed than others, the "bolters" were from 96 to 1,344 per acre; the acre had 21,120 plants. The amount of water and of organic matter in the different varieties was estimated and found to vary greatly, the water from 87·43 to 93·51 per cent., in only 3 cases out of the 25 was it below 90 per cent. The organic matter in the roots varied from 5·38 to 11·27 per cent., but only in one case reached 10 per cent. It seems from this as though the roots were quickly and coarsely grown and somewhat immature when harvested. The value of the crops reckoned from the yield per acre at 15s. 1d. a ton is given, and from the organic matter at 8s. a cwt.; there are big differences in the calculated values, only in one case, that of the best mangels, does the value calculated from the organic matter exceed that calculated from the gross yield, in many cases it is far below the value reckoned from 15s. 1d. a ton. Only in the one case does the value of the roots per ton, calculated from the organic matter present at 8s. a cwt., reach 15s., in 6 cases it is below 10s. The great value of these experiments is to demonstrate that the variety which gives the heaviest yield does not by any means necessarily give the greatest amount of organic matter, that is of nutritive matter. In fact one ton of the best mangels in these experiments contained more real food material than two tons of one or two of the poorest quality. Similar experiments were made with 23 varieties of swedes. These received 10 tons farmyard manure, 6 cwt. superphosphate, and ¾ cwt. ammonium sulphate per acre. The total yield per acre varied much and from it no valuable result was obtained, as the whole crop was attacked by Finger and Toe and some plots suffered more than others, There were not such great differences in the composition of swedes as in the case of the mangels. The water varied from 88·48 to 90·48 per cent. and the organic matter from 9·47 to 11·09 per cent. In comparing the money value, the swedes are valued at 10s. 2d. per ton and their organic matter at 5s. per cwt. Using this latter standard the value of the roots per ton varies between 9s. 1d. and 11s. 1d. a ton. It is not clear to us why both in the case of the mangels themselves and the organic matter of mangels, the money value originally assigned should be so much greater, 50 per cent. or more greater, than in the case of swedes; it is certainly not borne out by the composition of the roots, as far as it was determined, in these experiments. We trust that the attention of farmers all over the country will be strongly drawn to the main fact brought out, that the weight of roots produced is not the only consideration and may not even be the first consideration, especially in the case of mangels. We have not followed the writer in his spelling of mangold, but adopted the form we believe to be more correct.

Proceedings of the Agricultural Research Association, 1900. By Thomas Jamieson. Experimental Station, Glasterberry, Milltimber by Aberdeen.

The principal work of the Association during last year was a continuation and extension of the work on the cross fertilisation of oats. The experiments and observations of this and two former years seem to show conclusively that oats are easily cross-fertilised, and that this occurs to a considerable extent in nature when different varieties are growing near each other; and that this crossing renders the harvest, both of grain and straw, heavier. Mr. Jamieson points out that, from his observations, on set plants, the anthers are ripe and protruded before the ovary is in aptitude for impregnation, and that the anthers shed part of their pollen outside the flower. He concludes that the two feathery structures in the gramineæ, usually called stigmas, perform no stigmatic action but are brushes for the purpose of forcing the anthers outside the flower before it opens; that the real stigma is the blunt head of the ovary; that when the female organ is in fit receptive condition the flower opens to receive foreign pollen; that the whole arrangements and operations of the flower of the oat are admirably adapted for cross-fertilisation; the pollen of a flower being ripe and shed (in part at least) before the female organ is in a receptive condition, it seems to follow that cross-fertilisation is the rule rather than the exception. Should these views be fully confirmed by further investigation the views of a good many botanists and vegetable physiologists on the fertilisation of the grasses generally will have to undergo modification.

CULTURA DEL FRUMENTO. Experimenti di Italo Giglioli, M.R.A.C., 1899-1900. Portici: Tipografico Vesuviano. 1901. pp. xx. and 159.

The talented Professor of Agricultural Chemistry at the Agricultural College, Portici, gives a report of the experiments at the Experimental Station at Suessola, where for thirteen years in succession wheat and maize have been continuously grown. The report is suitably dedicated to the memory of Sir J. B. Lawes and to Sir J. H. Gilbert. The experimental field is about 6 kilometres from Acerra, in the Province of Caserta, and is divided for these purposes into plots of an average size of 44 square metres, of which there are a total of 123. This year experiments were specially made with applications of leucite [K_2O, Al_2O_3, $4\,SiO_2$] to supply potash, of manganese binoxide, and on the influence of electricity. The stimulation of electricity, and especially of voltaic electricity, which was compared with atmospheric electricity, had some little beneficial effect on the harvest. Leucitic earth seemed to be quite capable of supplying the necessary potash, by its use a greater yield of total produce was obtained than with potassium chloride. The binoxide of manganese seemed to have a useful effect in some cases, especially when used with nitrate of soda. Further experiments with this are desirable. The value of these experiments, like those at Rothamsted and Woburn, is largely due to their being continued under exact conditions year after year on the same plots.

PUBLICANS AND SINNERS. By Godfrey Bosvile. London, Simpkin, Marshall, Hamilton, Kent, and Co. 1900. Crown 8vo. 6/.

The columns of our paper devoted to reviews are mainly given over to the discussion of matters connected with agriculture or agricultural chemistry, and it is not usual for us to be called upon to review a work of this kind, but seeing that the author is a late student of the R.A.C. and will be well remembered by some of our readers we gladly notice the book. The work certainly contains a record of the sowing of a large crop of wild oats, of which the harvest was not so plentiful as some moralists would have wished, this is the only agricultural bias we detect. However we have no hesitation in saying, on the authority of one in whose judgment we have full confidence, that it is a very interesting book, and has the merit of introducing a very novel idea. The work is, however, somewhat unequal, and the contrast between the power and pathos shewn in the chapters which give us "Socks'" brief love story and death, and the earlier portions of the book is very marked. The word painting of some of the scenes in the book is excellent, and the best of these are the description of a steeplechase and of a night excursion on the water. The chief personality in the book is a difficult one to realise, and it may be on this account that a sense of curious inequality is conveyed when reading of his many sided character. We are sure that the majority of readers will find pleasure in this novel, and we trust that they will recommend it to their friends as a good novel to get from the circulating library; also, we are sure that with a certain amount of practice, which would follow success, Mr. Bosvile could produce a novel of even greater excellence than this.

630.5
AGT

U. OF ILL.
JUL 15 1942
PER. DUPS.
COPIES

NEW SERIES.

Agricultural Students' Gazette.

Vol. X. DECEMBER, 1901. No. 5.

FOOT AND MOUTH DISEASE: WITH AN ACCOUNT OF THE OUTBREAK IN SUFFOLK DURING 1901.

Foot and Mouth Disease, *Eczema Epizootica*, is a highly contagious and infectious febrile disease, affecting the skin and mucous membranes, and characterised by a vesicular eruption. The vesicles or blisters are, as a rule, large and few, and do not arise from an inflamed base. Upon removal of the elevated epithelium an intensely red spot is revealed with an elevated border round it.

The cause of the disease is doubtless a living germ, a bacterium or micro-organism. It cannot occur spontaneously. It can only break out through healthy animals being brought into contact with others affected with the disease, or through infected matter being brought to them by some outside agency.

The disease attacks cattle, sheep, goats, swine, and poultry, and the incubative period is from forty hours to from four to seven days. A rise of temperature is one of the premonitory symptoms, and the animal frequently smacks its lips, and shows by the movement of the tongue that the mouth is the seat of suffering. In cattle, the saliva flows freely from the mouth. An examination of the mouth shows the existence of vesicles on the tongue, on the inner part of the upper lip, and on the dental pad. Often the vesicles are broken, exposing the surface beneath. The animal seldom refuses food, but rolls it about in its mouth and frequently drops instead of swallowing it.

In most instances the feet are affected as well as the mouth, and blisters will form between the toes, but more especially on the heels, causing the animal to walk tenderly, and frequently to catch up one foot after the other and to shake it as if to dislodge something which was producing pain. In milch cows the teats are occasionally affected with vesicles, especially at the opening of the milk duct, which often lead in this situation to sores and crusts being formed, preventing the ready flow of milk.

The disease is of short duration, and in its uncomplicated form ends in the restoration of a healthy condition of the system generally, in a week or ten days time, but many causes may tend to retard its favourable course, *e.g.*, insanitary influences, debility, and bad treatment, especially in regard to diet. Death occurs in but a small percentage of cases, and under ordinary circumstances animals which have recovered from Foot and Mouth Disease are not liable to the affection again

Sheep are liable to attacks in the same way as cattle, but they most frequently suffer from the disease in a modified form. The mouth in many instances does not present the indications of the disease which are seen in cattle. Sheep being dry-mouthed animals, there is not that copious flow of saliva so typical of Foot and Mouth Disease in cattle, but the feet are almost without exception affected in a characteristic manner, indeed much discussion has arisen out of the circumstance that the vesicular epizootic disease of cattle is often confined to the feet of sheep, and frequent attempts have been made to prove that the disease in sheep is the common foot-rot, and not the epizootic affection of cattle at all.

As stated by Sir George Brown, it would be impossible by any length of argument to convince a large class of practical men whose minds are made up on this point, as to whether a sheep was affected with Foot and Mouth Disease or some common form of foot affection, but nevertheless no problem in pathology is more easily solved. Of the several quite distinct local diseases of the foot of the sheep, not one is distinguished by the presence of a blister or vesicle in any part of the foot, while in Foot and Mouth Disease there are always vesicles present, or distinct evidence of their having been present; there is also a general absence of that condition of hoof which is usual in foot-rot. In exceptional cases the hoofs are elongated, much broken, ragged and rotten, but this condition has nothing to do with Foot and Mouth Disease, which always commences at the top of the foot on the true skin between hair and hoof, and is indicated by the presence of vesicles between the claws in the back part of the foot immediately above the hoof, and sometimes exactly on the portion of the skin, between the digits, which covers the transverse ligament connecting the two sides of the foot together, and therefore distinct when the digits are pulled apart. When the back part of the hoof is separated from the secreting membrane, as is often the case in Foot and Mouth Disease, the vascular surface is seen to be congested, but there are no signs of the so-called fungoid growths which distinguish foot-rot. Independently of the diseased parts, there is in Foot and Mouth Disease clear evidence of fever in the system. Making allowance for the variation of temperature in sheep, which in health will range from 101° to 104°, the increase is quite marked, as the temperature in diseased sheep will range from 104° to 107°.

Vesicles in the mouth of sheep, although not so generally present as in cattle, are very commonly found when looked for, and in lambs a few weeks old vesicles not larger than a hemp seed have been detected on the tongue.

Another point which distinguishes Foot and Mouth Disease from other diseases of the foot of the sheep, is the rapidity with which they fall with it if herded together.

Pigs suffer severely from Foot and Mouth Disease, and it often assumes a very malignant form among them. Vesicles appear on the outside of the snout and along the edge of the upper lip, on the udder in sows, and almost invariably on the feet. The hoofs are constantly separated from the internal foot and fall off.

So much then for the nature and symptoms of a disease which has imposed far greater losses on the country than all other diseases combined.

The first and general outbreak lasted for a period of more than fifty years. The disease was seen and recognised in 1839, and continued with more or less prevalence until 1886. That the losses caused by the outbreaks amount in the aggregate to hundreds of millions sterling is beyond question. For example, in 1870, it is stated in the official returns that there were 82 counties in Great Britain infected and 457,564 animals diseased, whilst in 1871 there were 92 counties infected and 691,560 animals diseased. Large as these numbers were it is likely that the actual total was probably double that reported. In 1872, Mr. Duckham states that in his own county of Hereford 34,212 cattle were attacked and 2,047 died; 107,789 sheep were attacked and 1876 died; 8,220 pigs were attacked and 1,523 died; the estimated losses sustained by the visitation being £155,226, and the comparative estimated loss sustained by the nation to £13,071,392. The late Mr. James Howard, when giving evidence as to the visitation of Foot and Mouth Disease in Bedfordshire in 1872, said at the lowest estimate it entailed a loss of £60,000 upon his county. The Contagious Diseases Animals Act came into force on 1st October, 1878, and at the close of 1879 Foot and Mouth Disease was so nearly exterminated that it was looked upon as almost a thing of the past. It was, however, imported again in a cargo from France landed at Deptford the 20th September, 1880. In a few days it was reported as being in a London dairy shed. The Metropolitan Market was then open. The same salesmen and butchers travelled to and fro between Deptford and Islington. The same drovers attended the cattle in their lairs in each market. The number of cases increased so rapidly, that by the close of the year, the returns of the veterinary department showed that the number of animals attacked in 1880, from the 20th September to the end of the year, was 32,378; in 1881, 183,046; in 1882, 37,950; in 1883, 461,145; and in 1884, 28,221, making a total of 742,740 for the five years.

The disease then decreased until 1886, when a solitary outbreak took place, but after six years immunity from its ravages, an outbreak occurred in 1892 in the Metropolitan Cattle Market amongst some Dutch cattle, and notwithstanding the energy displayed, there were 95 outbreaks, 5,265 animals attacked, 585 diseased animals slaughtered, and 151 died. In 1900 there were 21 outbreaks, in which 266 animals were attacked and subsequently slaughtered.

Judged by the above figures, the immense gain in dealing with the disease by means of slaughter must be patent to everyone. For example in the eighties 742,740 animals were attacked in consequence of the importation of the disease from France, and in 1892 5,265 animals were attacked as a result of an outbreak amongst some Dutch cattle. In neither case was universal slaughter resorted to, but in 1900, when it was, although there were 21 outbreaks, yet owing to the prompt measures taken the disease was kept within bounds, and instead of thousands of animals being attacked as had been the case in previous outbreaks, only 266 animals were lost, a result of which the Board of Agriculture may be justly proud.

We now come to the outbreak in Suffolk during the present year. The first case was reported on the 26th January, and confirmed two days later. It occurred among a herd of cows on a farm near Ipswich. Three animals were attacked and 40 slaughtered. The cause of the outbreak has unfortunately not been discovered. The Board of Agriculture at once shut up a large district comprising some 400 square miles in extent, closed all the stock markets within it, and issued the most stringent orders prohibiting the movement of stock into or out of the scheduled district, and along the highways or thoroughfares.

The next outbreak was reported by the same farmer on the 31st January, and confirmed on the 15th February. It occurred within two miles of the initial one. Three animals were attacked and 21 slaughtered. There is no doubt that this outbreak was caused by the farm bailiff going to and fro amongst other stock on the two farms and carrying the infection with him.

The third outbreak was also reported on the 31st January, and confirmed on the 1st February. One animal was attacked and 8 slaughtered. A further outbreak was reported on the same day and confirmed on the 5th February. One animal was attacked and 28 cattle and 9 pigs were slaughtered. In both these cases the infection was almost certainly carried by the local veterinary surgeon, who had attended cattle upon the farm where the disease first broke out, and who went with an interval of two days to the occupation where the third outbreak occurred and attended an animal there. This animal was the first to fall with the disease.

He subsequently went to the fourth farm and attended a cow, which had been isolated in a shed by itself after calving. Again, on this farm, the attended animal was the first to go down with the disease.

The fifth outbreak was reported on the 18th February and confirmed on the 21st February. A large number of sheep were attacked, and 210 sheep and 4 sows were slaughtered.

The sixth outbreak occurred on the 23rd February; several hoggets were attacked and 235 sheep and 6 cattle were slaughtered. The seventh and last outbreak took place at a farm in the same parish as the previous one. It was reported on the 7th March and confirmed on the 8th March. Four animals were attacked, and 25 cattle and 19 pigs were slaughtered.

All the outbreaks occurred within a radius of five miles of one another, but the cause of the first and the last three remains undiscovered. The scheduled district was declared free on the 8th April, the disease having been completely stamped out in the county.

Now in outbreaks of this kind, owing to the stringent orders and precautions which the Board of Agrioulture are obliged to enforce, there is bound to be an enormous amount of interference with private business management, and consequent heavy pecuniary loss and inconvenience. There is also bound to be a somewhat general feeling amongst agriculturists that the restrictions impose an amount of unnecessary hardship and loss upon them, and they are not too ready to see, even in the face of overwhelming facts, that the end certainly justifies the means, and that the strict regulations are framed solely with the intention of giving the least inconvenience by adopting the quickest and surest method of getting rid of the disease out of the district.

The most striking point, however, with regard to the past outbreak, is the extraordinary fact that the owners of the slaughtered sheep maintained that the latter had not Foot and Mouth Disease at all, and this too in the absence of any expert evidence whatever, and in the face of some of the best veterinary testimony of the day.

With regard to the fifth outbreak it is no doubt a remarkable fact that the disease must have existed on the farm for at least a fortnight, probably longer, before it was reported; also that the same man who saw after the sheep also milked the cows and did not convey the disease to them; also that a well-known dealer went among the sheep and from them to his own flock, and yet conveyed no disease to them. Also that other sheep belonging to another owner were feeding not many yards away from the diseased sheep but did not take the complaint. Also that other persons went among the sheep before they had been reported, and went from them to other stock without carrying the infection.

From the above facts the conclusions were drawn that either the sheep were not suffering from Foot and Mouth Disease at all, or if they were there could not be anything like the same danger of conveying the infection from sheep suffering from it, as there would be from cattle affected with it. Now, owing to the fact previously mentioned that the sheep is a dry-mouthed animal, it is generally admitted that infection in the case of sheep is not so easily carried as it is in the case of cattle, because there is not so much chance of saliva full of infective matter getting on persons and things, and so being carried to other stock. Nevertheless the disease, even in the case of sheep, is extraordinarily contagious, necessitating the greatest possible precautions and restrictions to prevent its spread, for there are many well authenticated instances of the disease being conveyed from sheep to cattle.

The other point is more obscure until we consider what often happens in the case of epidemic diseases of man.

In the epidemic diseases of man, such as small pox, scarlet fever, and the like, it would be quite possible for anyone to visit a house which a doctor had declared to be infected with say scarlet fever, and then to go to one on the other side of the street, and yet not carry the infection to that particular house, but upon afterwards visiting a house in a village a few miles off, to cause an outbreak of the disease there.

Again it would be quite possible for two, three, four, or more persons to go to and fro between an infected house and a healthy one and yet not spread the disease, while the fifth or sixth person might do so. On the other hand the disease might not break out at all, and the fact that it did not do so would cause no surprise to members of the medical profession, although persons ignorant of the nature of it might declare that it was in consequence not a case of scarlet fever at all. Now epizootic diseases in animals, such as Foot and Mouth Disease, Swine Fever, &c., correspond to epidemic diseases in man, and if fields are substituted for houses, the above remarks on the vagaries of scarlet fever, apply with equal force to Foot and Mouth Disease, and would appear to furnish a cogent reason why disease was not carried from the sheep in question, that is so far as is known.

One of the most unsatisfactory features in connection with the outbreak in Suffolk is that the cause of the disease has not been traced or discovered. It can only be said it is well known that the infection of Foot and Mouth Disease may be conveyed from long distances by persons or substances which have been in contact with diseased animals. It is also known that for many years it has been exceedingly rife on the Continent, especially in those countries nearest England. In France, Holland, and Belgium it has been widely prevalent, and as the outbreak occurred practically on the East Coast of England it is but reasonable to assume that it was carried to this Country from the Continent. It is evident that we are always exposed to the imminent risk of having the disease re-introduced by some intermediary agent, and it is a matter of surprise that it has not more frequently found its way into this Country.

Within the last few weeks short accounts have appeared in the Agricultural Press describing a cure for the disease discovered by the Italian Minister of Agriculture. It consists in injecting sublimate of mercury into the veins. One can only hope the treatment may prove a successful one, for nowadays a reoccurrence of anything like the former serious losses from Foot and Mouth Disease would mean ruin to the agricultural community, since stock and not corn is now the backbone of the industry.

Until some reliable cure is discovered, too much support cannot be given to the regulations imposed by the advisers of the Board of Agriculture, who enforce regulations in the case of an outbreak, not to amuse themselves, but in the earnest, strenuous, and humanitarian hope that they will stamp out a disease which might be of the gravest possible consequence to the Country.

E. J. Cheney, M.A., M.R.A.C.

FARMING IN INDIA.

The point about Indian farming which would probably most strike a newcomer is the absence of farms—in the English sense of the word. This is due principally to the diversity of the quality of the soil in quite small areas. A landlord in order to get all his land occupied divides each portion of a particular character amongst all his tenants. He also has to consider the gradation from high to low land, which owing to the climatic peculiarities of India has an especial significance: bumper crops in the high land often mean failure in the low, and *vice versa.* An Indian farmer therefore generally has as many as twenty plots all at a considerable distance from each other. Their houses cluster together in one village; a plan doubtless owing its origin, in times before the British occupation, to the best method of self-protection against marauders—human and beast.

Another prominent feature, to use an Irish bull, is the absence of boundaries or hedges; banks only being seen in the rice lands for the purpose of retaining the water. Hedges would not be at all suitable; in the "rains," when most vegetation goes mad, they would get out of hand and harbour weeds: in the dry season they would certainly have a deleterious effect for a considerable distance on the crops which they were placed to protect and which require all the moisture available in the soil.

The ploughing is done entirely with bullocks; docile, hard-working beasts, with a hump especially provided by nature for bearing the yoke. There is practically no pasture and the cattle are all "stall-fed."

The soil on the whole is very fertile, a great proportion giving splendid crops of the most valued produce twice and sometimes thrice annually. Here and there patches of soil are met with so strongly impregnated with sodium salts as to be quite unfertile, the ground appearing at times white with the snowy efflorescence; the natives account for this by a theological process somewhat analagous to that by which, the classics tell us, a mythical deity once answered the prayers of a childless suppliant.

The native farmers appreciate the full value of manure, such as lies in their hands, making probably the best use of it. Unfortunately the supply is limited, and much land has to depend on careful manipulation and favourable atmospheric conditions alone. Their patient, minute, and laborious husbandry is very remarkable.

In the greater part of the rice crop, the seedlings are all carefully transplanted for tracts of a thousand acres. The Indian corn is weeded to absolute cleanliness from the time it is above ground till the cobs are well formed, sometimes as often as six times, the soil being thoroughly worked up with the trowel on each occasion. When the poppy crop ripens each head is scratched at evening and the exuded opium scraped off next morning; the poppy head is thus treated five or six days running. When it is understood that it grows nearly as thick as corn the immense labour involved can be appreciated.

Considering his limitations, the Indian farmer is a past master in agriculture, and probably does the best possible under the circumstances.

Dr. Voelcker, at the request of the Indian Government, some ten years ago travelled through India to see what could be done to improve Indian agriculture. His report thereon is a masterpiece; amazing in its complete grasp of the minute details of numberless different systems throughout a continent; the work of a lifetime done in a year. He gave many suggestions. Some of his remarks should they be read now for the first time would appear at this period quite prophetic; but on the whole one cannot help being struck with how, Balaam-like, he came to curse and stayed to bless. Again and again he suggests, not that some new Western or scientific device should be introduced, but that merely the methods of one district should be taught in another not so favoured. He even concedes his blind confidence in reference to a certain agricultural operation which apparently violated alike all canons of theory and practice because on other points of clear significance the perpetrators were such perfect farmers. And, if practice tends to make perfect, should they not be so? Agriculture should be an instinctive function with them.

In all the historic turmoil of India, as new hordes of masters overran the country, the "farmers," though they must have undergone plenty of illtreatment, had to be retained to get the best revenue from the land.

Doubtless the ancestors of many men now occupying the soil were ploughing the same old lands much in the same old way just about the time when in óur country the "woad" trade was being convulsed by the introduction of a cheap chemical substitute (from Germany); when our forefathers were wondering if the limit of scientific discovery had not been reached because iron knives were cutting out the good old flints; and indignant protests were being sent to the "Times"—published then at Stonehenge—because life and limb were endangered by the terrific speed attained by the sledges raised on the new invention called "wheels."

There they are still! the Indian farmer, one piece of cloth round his head, another round his middle, his entire wardrobe, often indiscriminately transposed, cheerily twisting his little bullocks' tails, while the squeaking wooden plough turns up the hard worked soil.

There they are still! Surely the most patient man with the most patient beast on the most patient soil in all the world.

W. A. Vincent.

THE ART OF OBSERVATION.

By T. R. Cholmondeley, M.R.A.C.

When the Student is leaving College and wishes to apply the theoretical knowledge there acquired to the everyday experiences of common life, he must consider how he is qualified to attain success in the business he chooses for his profession. Whether he decides to become a farmer, a surveyor and valuer, or a land agent, all of which professions have more or less to do with an outdoor life, he must endeavour to cultivate the qualities necessary to success. Now in the opinion of the writer no quality is more important in any of the above professions than the art of observation, the quality of always noticing things as they present themselves to the eye, and contrasting the appearance of to-day with that of yesterday. How many people go through the world without noticing the things around them or even under their feet, how few apply such knowledge when they have it to their own advantage and instruction. The farmer must train his mind to watch the life and habits of his stock, and gauge the characteristics of the soil he works under varying conditions of weather and temperature. The surveyor must be able to form an opinion promptly for the valuation of subjects strange to him, and make allowances for apparently trivial details, which however may affect values to a considerable extent. The land agent has before him the most difficult problem of all, the knowledge of men; he must learn the character of every tenant on the estate he manages, and be in touch with the personal peculiarities of the men he employs.

Observation of small things apparently uninteresting stores the mind with detail and enables a man to form an opinion on many subjects, and to give the reasons on which such an opinion is based. Mistakes of course will arise at first, but industry and application, if wedded to the art of observation, make such errors of very unusual occurrence. Having shown how important a part this gift of observation plays in the business of life, it now remains to endeavour to give a few practical suggestions for its cultivation to those who by nature or otherwise are not so fortunate as to possess it.

In the first place our much maligned English weather always furnishes a subject which is well worth careful and constant study. Without troubling the mind with the accumulation of scientific returns of rainfall and temperature, even the most unmethodical can always note the weather glass, the direction of the wind, and atmospheric conditions preceding storm or other unusual weather, and such a habit when once started will be followed in a very short time without effort and to the great interest of the observer.

Secondly, an attempt should be made to cultivate what is sometimes called an eye for country. This especial quality is indispensable to the soldier and to the hunting man; the one trains his eye to find cover for his men, the other to know the best line a horse can take across country. In a more humble way the professional man may utilise a journey by train or road to seize the most salient characteristics of the country through which he travels; the result is a continuous exercise of the mind which soon acquires rapidity of perception and intelligence unknown before. The farmer becomes aware of what is being done on land other than his own; the valuer has a rapid survey of property in all its details; and the land agent perhaps sees beautiful buildings which he wishes in his heart might be his lot to erect on estates under his own management.

Thirdly, it is of immense advantage to a man of whatever condition of life to have a hobby or some subject of relaxation which may have a direct or indirect bearing on his real business. All research, if used as a means of relaxation, acquires an interest which has a more lasting hold on the mind than any professional business or employment. No difficulty should be found in the choice of a hobby. The study of animal and vegetable life is within the reach of any student of the microscope; to others the germination and growth of seeds under varying conditions of heat and moisture; the life and history of weeds, even after lying dormant in the soil for years, or the multiplication of varieties of plants by cross fertilisation may present a more effective appeal.

In conclusion it may be said that no novelty is claimed for these few and slight suggestions: they are as old as the hills, and must have often been urged in the columns of the *R.A.C. Gazette*, but old things come out as new, and a fresh generation of students may perhaps derive some advantage from a thrice told tale. But the maxim is now as it was of old—"Observe, always observe."

A CONTRAST IN CONFORMATION, HUNTER v. SHIRE.

A Lecture delivered at the Royal Agricultural College, on July 17th, 1901.

My subject is one of great interest to all lovers of horses, and yet conformation as a science has been and still is greatly neglected in this country. There is a very prevalent fallacy in the British Isles by which each individual thinks himself a born judge of a horse. People with this idea pretend to despise the use of the tape measure on horses, and loudly express the opinion that it is impossible to teach a man to be a judge of a horse. But, although readily granting that some amount of what may be called natural instinct is necessary, it is obvious that even persons possessing this instinct will benefit considerably by a little scientific training. It is interesting to add that the Royal Commission on Horse Breeding make use of the tape measure, and that all the premium-winning stallions at the Hunters' Improvement Society's Show are submitted to its impartial judgment. On the continent much valuable work has been done in putting the subject of conformation on a scientific basis, and particular mention must be made of M. M. Goubaux and Barrier's book, "The Exterior of the Horse."

In England the only serious attempt to deal with this subject has been made by Captain M. H. Hayes, F.R.C.V.S., and it is to his very excellent book, "Points of the Horse," that I am indebted for much of the information I shall lay before you.

Conformation may be said to treat of the shape, size and proportion of an animal in health, compared with others of its own species, both as a whole and in its parts. A knowledge of this is useful both for scientific breeding, and also for judging of the best types, having the greatest mechanical advantages for the various kinds of draught or carrying purposes.

In order to bring out more forcibly the interesting points, it is my intention to contrast horses of speed, as represented by the thorough bred, and horses of strength, as represented by the shire; the modifications necessary for jumping power will be noticed along with the thoroughbred. It may be well to state that although the rules laid down are in the main correct, and should be the aim of the breeder, yet they are only general and the exceptions numerous.

First, to get a general idea of a horse, the following measurements will be found extremely useful, viz. :—*Height* (a) at withers (b) at croup; *Length*, from the point of the shoulder to the point of the buttock; *Girth*; *Depth of Chest*, from top of the withers to the brisket; and lastly the *Circumference* (a) above and below the knee (b) above and below the hock.

These being taken, one or two notable relations are seen to exist in horses of the same kind, and some remarkable contrasts appear in horses of different types and for different purposes.

Comparing Height with Length, in the thoroughbred the height (at withers) is generally 2 or 3 inches greater than the length, whilst in the shire the height is generally 7-10 inches less than the length.

Comparing Length of Leg with Depth of Chest, in the thoroughbred the depth from withers to brisket applied to the fore-limb only goes from the brisket to the bottom of the fetlock joint, whereas in the shire the "depth" is 3 or 4 inches greater than the length from the brisket to the ground.

Comparing Height at Withers and Height at Croup. It may be stated that, other things being equal, the longer the hind leg the greater the speed. But if the hind legs are longer than the fore legs, more weight is thrown forward, and the animal soon wears in front. In a hunter, too, if the weight is too much on the fore legs the animal is unable to rise well at his jumps. Agreeably to this we find that in the thoroughbred (flat racer) the heights are about equal, in the hunter and cart horse the height is greater in front. It may be noted that the American trotter, having little weight to carry and requiring great speed, is higher behind.

Comparing Width of Breast ("breast," not "chest") or *Width between the Fore Legs.* Great width may be said to be due to development of the pectoral muscles and those muscles which unite the fore limb to the trunk, great strength of which is not needed in the thoroughbred, but is essential in a cart horse. Thus we find thoroughbreds and hunters possess narrow breasts, whereas shires are very wide and muscular.

Weight of Body, chiefly considered *in relation to the Limbs.* A saddle horse, racer or hunter, should be as light as possible in the body, or the legs are soon worn. If too heavy in front, the horse is sure to be heavy in hand. A cart horse such as a shire, however, needs relatively more weight to increase his power in draught, and working generally at a slow pace, and having little weight to carry, a worn condition of the limbs is not so easily produced. Thus a shire is heavy and massive particularly in front. In this connection it is necessary to notice the position of the centre of gravity in a horse. Colin, the great French physiologist, says "The centre of gravity is a point at the intersection of two lines, one vertical behind the xiphoid cartilage of the sternum, and the other horizontal through a line dividing the lower from the middle third of the body." Assuming this, it is found that the fore legs bear more weight than the hind legs, in the thoroughbred in the proportion of 5 to 4, and this because of the long neck of the well-bred horse.

And now to consider the significance of some of the foregoing comparisons.

Length of Body. For great speed and for jumping power, essentials in the thoroughbred and hunter, a horse must have a very free *forward reach* with the fore legs. To obtain this the centre of gravity—an ever-changing point—must move backwards quickly to lighten the forehand, and this is brought about by what may be called the rearing muscles, the muscles on the top of the loins and down the back of the thigh. If the shoulders are heavy, or *if the back is long* these muscles soon tire, and it is for this reason that a short body and back are essential in a thoroughbred or hunter. In a cart horse, on the other hand, since the line of action of the pull is from the collar, through the back bone and pelvis and down the hind limb, the flatter or straighter this line and the more direct the pull. Thus it is an advantage for a draught horse to have a body long as compared with his length of leg, and to be higher at the withers than the croup.

Width of Breast, or Width between the Fore Legs. In all paces, particularly fast ones, there is a tendency to *lateral displacement*, or *rolling*, due to propulsion alternately from one side and then the other. To prevent this displacement muscular effort is needed, and so it is impossible to use the maximum force for progression in a straight line, hence less speed is attained. Obviously the nearer the fore and hind limbs of one side are to their fellows of the other side, or the nearer each limb is to the vertical plane through the centre of gravity in the direction of the animal's length, the less the displacement, and other things being equal, the greater the speed. Thus in a thoroughbred the breast can hardly be too narrow. On the other hand, width gives room for the development of massive muscles uniting the fore limb to the trunk, and is consequently a very desirable point in draught horses.

Position of Centre of Gravity. It is a fact easily demonstrated that the lower the centre of gravity of a body and the more stable its equilibrium. Now stability is essential for an animal to put forth all its strength, so that a cart horse should have its centre of gravity low, or in other words should have short thick legs. During progression the centre of gravity is constantly being displaced at all paces, in fact displacement of the centre of gravity is necessary to progression, and it will easily be perceived that "the greater the instability of equilibrium during each step at any pace, the greater will be the speed at that pace" (Hayes), or expressed differently, the more insecure the balance during movement, and the quicker will the limbs be advanced, *i.e.*, the greater will be the speed. Agreeably with this, the centre of gravity of the thoroughbred is high, because of the animal's long legs.

And now to pick out a few of the more important points in the conformation of separate parts.

Head. The head should be proportionate to the body.

In the well-bred horse it should be fine, sharply chiselled, with a good wide forehead, and a straight or sometimes slightly concave profile. In the shire the head is coarser, and the profile is very commonly convex, *i.e.*, the horse has a "Roman nose."

Neck. In a thoroughbred the neck should be lean and of a good length, for there is a relation between the length of the neck and of the muscles which move the fore limb, and so good length is necessary for speed. A thick short neck makes a horse clumsy and heavy in hand.

In a cart horse the neck is shorter and more massive, but should be long enough to allow of grazing. In all cases the throat and windpipe should be as wide and open as possible to allow of free breathing.

Trunk. One of the most important points to which attention should be paid is the "*Spring of the Ribs.*" The ribs must be (a) a good length, (b) very well arched, so making the barrel very round behind the shoulder, and (c) well inclined backwards. If the last rib is long, well sprung, and well directed back, there will be little space in the flank, and the horse may be said to be "well-ribbed-up." The "*Depth of Body*" at the lowest point of the back should also be good, for a good depth and good ribs account for great chest space, and so *staying capacity*, so essential in both thoroughbred and hunter. The term "slack-in-the-loin" is the opposite of "well-ribbed-up," and is used when the last rib is short and there is a big space left in the flank. A horse "slack-in-the-loin" usually has either too small a chest or too long a back, or both, and is generally unable both to gallop and to stay.

Withers. This term is applied to the prominent part of the horse's back in front of the saddle-seat, and the elevation is due to the long dorsal spines of the vertebræ. Withers high and extending far back afford room for the attachment of powerful muscles to extend the fore limbs, and so make the animal strong in galloping. Good withers generally accompany sloping shoulders; low thick withers go with short upright shoulders. A thoroughbred should have withers high and extending a long way back. A shire should have withers lower and much thicker, the extra weight being an advantage in draught.

Width of Chest or *Width through the Heart* is essential for good breathing, and so for staying capacity.

Back and Loins should be short and as flat as possible from side to side behind the saddle. Flat loins show good development of the muscles which move the hind limbs and are essential to speed, while a short back is necessary for weight-carrying power.

The Fore Limb. A point worthy of note is the complementary relationship in the length of the bones. A long shoulder is generally accompanied by a short arm, a long forearm, a short cannon and long pasterns. Similarly in the hind limb, if the pelvis is long, there is usually a short thigh, a long tibia and a short cannon. Returning to the fore limb, its objects are mainly (a) to carry weight, (b) to raise the fore-hand, (c) to propel the body, but in carrying these out it is necessary to provide against wear of the limb itself. Without doubt concussion is the greatest cause of wear and there is most concussion at fast paces, so that some provision to lessen it is needed in all animals used for speed, such as the thoroughbred and hunter. The natural provision is an oblique direction of some of the bones of the limb and particularly the shoulder and pasterns. It is essential that both should be long and sloping in the thoroughbred. In the shire horse concussion is much less, because of the slower pace, in fact if a draught horse is only to be used at a walking pace more upright shoulders and short straight pasterns afford a mechanical advantage, whilst the extra concussion is too small to be of any moment. There remains still one important point to be mentioned in connection with the cannon or metacarpal region. The cannon must in all cases be as short as possible, and must not be "tied in" below the knee. In weight-carrying hunters it is essential that they should have a large amount of "bone" immediately below the knee. In other words, the measurement 'round the metacarpal region, including in the tape the metacarpal bones and the tendons of the limb, should be large. The term "tied in" is sufficiently expressive, and refers to the metacarpal region immediately below the knee. This is often the weakest point in the limb, and it is much preferable for an animal to be "fine" all the way down, than be "tied in" just locally. As mentioned above, the pasterns should be long and sloping in a racer, shorter and straighter, to increase the strength, in a shire. In all cases the foot must be a good open one, for there is a good deal of truth in the old saw, "no foot no horse."

The Hind Limb. Space will not permit me to go into any detail with respect to the hind limb, so that only the more important considerations will be dealt with. The chief function of the hind limb is to propel the body, whilst at the same time it bears weight, although much less than the fore limb. Bearing less weight, the concussion is not so great as in front, and it is for this reason that the union of the hind limb to the trunk is boney and rigid through the medium of the pelvis, and not muscular and elastic as in the fore limb. For a similar reason, obliquity of the bones is not needed so much, and the pasterns and hoof are consequently much more upright than in front. For speed the hind limb must be long and must possess great power to quickly and forcibly extend, so that a long "straight-dropped" hind leg is very necessary in a thoroughbred. The conformation known as "sickle hocks," where the angle between the tibia and the metacarpal bones is reduced and the hock appears partially flexed, is a bad fault in a thoroughbred, and detracts from the horse's speed. The pelvis, for speed, must be long, or in other words a racer must possess long straight quarters. The slope of the quarters varies; in a cart horse when pulling, the line of force is transmitted through the back bone, quarters, and hind limb to the ground, and the straighter this line, the more force is utilised, so that a sloping pelvis and a proportionately short hind limb are desirable. But the thoroughbred *must have* a long hind limb to attain great speed, so that the pelvis must be horizontal. For jumping, on the other hand, it is essential that the horse should get his hind legs well under him when rising at a jump, and for this sloping quarters are useful, in fact this conformation is considered very desirable by many hunting men, and horses from the south of Ireland are commonly "goose-rumped." Many steeple-chasers, *e.g.*, "Soarer" also show this conformation. For both strength and speed, *i.e.*, in both shire and thoroughbred, the quarters and thighs should be very muscular, and the second thighs or "gaskins" should be wide and good. Below this point the hocks must be a good size, there must be no evidence of "tying in" below them, and otherwise the limb should be as described for the the fore limb.

In conclusion, although fully aware of many important omissions, the object of the writer will be attained if interest has been awakened in a fascinating and yet neglected subject, viz., the accurate and intelligent observation of the comparative points of the horse.

H. A. WOODRUFF, M.R.C.V.S.,
Professor of Hygiene, Materia Medica, and Therapeutics,
Royal Veterinary College.

Appended Table gives measurements of four King's premium winners at the Hunters' Improvement Society's Show, 1901.

Name of Horse.	Height in hands.			Girth, in feet and inches.	Length in feet and inches.	"Bone," below knee, in inches.
	At Withers.	Centre of Back.	At Croup.			
Irish Wake ... s. Master Kildare	15 3⅞	15 0	15 3⅞	6′ 0½″	5′ 2″	8½″
Belleville ... s. Hampton	16 0⅜	15 0½	16 0¼	6′ 0½″	5′ 4″	8¼″
Rampion ... s. Amphion	15 3¼	15 0¼	16 0⅛	6′ 1½″	5′ 5½″	8½″
Sterling Bank ... s. Friar's Balsam	15 2¼	14 3¾	15 3¼	6′ 1½″	5′ 5″	8¾″

SUGAR CANE CULTIVATION IN BARBADOS.

Having lately returned from a lengthened stay in the island of Barbados in the West Indies, your readers may like to hear something from me of the cultivation of the sugar cane as it is carried on in the second oldest colony in the British Empire.

Barbados is often called Little England, or Bimshire, from the resemblance of the landscape in its southern parts to that of many a county in the South of England, while the hilly northern part, with its red soil, recalls in the gloaming many a vista of bonnie Scotland after which it is named.

The southern portion consists of a series of rolling plateaux of low elevation, ancient sea beaches formed by successive upheavals from the ocean bed of fringes of coral round a nucleus of the same rock formation, which constitutes the northern district; the highest point is a little over 1,100 feet above sea level.

The island, though hardly larger than the Isle of Wight, has a population of over 180,000, of whom some 15,000 are white, the descendants of many a proud Royalist family expatriated in Cromwell's chequered times, and perhaps here, more than in any other tropical colony, have the estates been held for generations by the same old families, many of the planters of to-day bearing the names of the original settlers of 200 years ago. This is no doubt in a large measure to be attributed to the healthiness of the climate, due to the naturally excellent subsoil drainage of the coral rock, also to the life giving breezes of the trade winds. The remainder of the population are negroes, whose ancestors were imported as slaves from Africa, who still show the different characteristics of the many tribes from which they were captured, and mulattoes, in about equal proportions.

The estates are small compared with those of British Guiana and Trinidad, where, many estates having been amalgamated, the properties are now of large extent. The estates in Barbados range from 1,500 acres, with an elaborate plant of modern steam machinery, to small holdings of 100 acres, or less, where the cane is crushed by wind power and the juice boiled to muscovado sugar in exactly the same way that it was by the first settlers.

The sugar cane is the staple crop, and on it alone depends the fortune of the island and its large population, for the dry, breezy atmosphere and calcareous soil are quite unsuited to such moisture and shade loving crops as cacao, nutmeg, coffee, &c., which flourish in the neighbouring hotter and damper colonies. The only other crops are sweet potatoes, yams, and eddoes, food for the people; and maize, guinea corn, imphee, and pastures of sour grass, fodder for the stock.

Of annual agricultural crops, the sugar cane is one yielding a very heavy return per acre, from 20 to 40 tons of cane, and perhaps 10 tons of tops, besides the dead leaves or "trash" that cover the field many inches deep: the yield of manufactured sugar is as much as three tons, besides a considerable residue of molasses, better known in England as treacle. The appearance of the crop is magnificent. As the planter rides along the roads between the fields, the canes are often so high that he cannot see over their tops: the vivid green of the leaves, the grey feathering tufts of the arrow, or blossom, in the month of November, and the rich colours of the stalk give an entrancing picture of tropical growth.

The crop is divided into plant canes, those planted afresh, and the ratoons, those which spring from the old roots from which a crop of plant canes has been cut off.

In July, as soon as the crop is over and the dressings of artificial manure have been applied to the canes for the next year, the planter is busy preparing his land for the planting season, which begins in the middle of November and lasts till the end of January. The land, which varies much in different localities, in some a rich black, in others a heavy clay, or a brown or red loam, is ploughed eight to ten inches deep by a swing mould-board plough drawn by six yoke of cattle, *i.e.*, 12 cattle fastened in pairs by a heavy yoke of wood across their necks to a strong chain attached to the head of the plough, the cattle driven by two negroes, with much shouting and cracking of whips, and kept on the land and out of the furrow as much as possible, whilst a third negro holds the stilts. It would astonish many an English farmer to see the thorough way in which the work is done, though under such conditions it is only natural that the furrows do not present the same neat, exact appearance as on the best English farms, where the ploughing is not nearly as deep, and has the advantage of powerful and intelligent horses, which would be unsuited to the climate and to the tender mercies of the negro. A curious sub-soil plough, with a "feather," as it is locally termed, or narrow inclined mould-board about four inches wide, attached to the side of the frame work and inclining from the share upwards and backwards, which has the effect of slightly lifting the soil as the plough passes through, is much used. In this case the land is usually ploughed one way early, and across later in the year. Of recent years the American disc ploughs have come into favour, as they turn over a wide furrow, require less power to draw them, and cut through the old stumps remaining in the ground from the previous crop, whereas these throw the English ploughs out of the ground, and when the latter are used the stumps have to be dug out beforehand by the negro with his heavy hoe. The American ploughs are unsurpassed for turning in trash or green dressing, but are apt to give irregular work, especially in the bottom of the furrow.

Owing to the large population and consequent abundance of cheap labour, much land is turned up by the fork; but this work, though superior to all other when properly done, requires the closest supervision, for the negro is an adept at scamping, leaving to the casual observer a fine appearance of tilth with the minimum of work performed. The next operation is the digging of the cane holes, one peculiar to those islands in the West Indies where the labour is abundant. In other parts of the world the cane is in most places laid in a furrow turned out by a plough, but in our little island a cane hole two feet square, and varying in depth from one foot in the hilly fields to perhaps three inches in the heavy flat lands, is dug for each cane plant. These holes are at different distances apart according to soil and conditions, in some cases six feet by six feet, but as close as five feet by four feet on the hills.

Very heavy dressings of farmyard manure, from 20 to 40 tons per acre, are now applied to the land: occasionally broadcast, but usually it is either put in the cane hole, to be cleaned out before planting and spread on the banks, thus leaving the bottom of the cane hole "sweet"; or in a hole specially dug for it alongside the cane hole. Very great care is taken in making up the farmyard manure. At the bottom of the pen in which the cattle are to be kept, a layer of fine mould is always placed; on this are laid the litter and the fodder. From time to time another layer of fine mould a few inches thick is laid on the pen. This mould absorbs much liquid manure which otherwise might be wasted, and the whole mass being trodden down by the stock is so compact, that even when it is in the open the manure is not much washed. Nearly every estate has large covered pens for cattle and mules. Any vegetation, whether bush trimmings, or weeds, or other green stuff, is always most carefully added to the pens, so that an immense amount of matter is collected. When the manure is to be taken out to the fields it is cut down straight by the heavy, sharp hoes, and filled into baskets to be carried on the heads of negresses to the carts. The prevailing custom is to cart the manure from the covered pens and to spread it in layers on pens 40 feet square temporarily made in the fields to which the manure is to be applied, the cattle being penned at night, and, of course, littered and fed on these until they reach three or four feet in height. The pens are then capped with mould, and when the time comes for application to the land, the manure is again cut down by hoes and loaded into baskets which are carried on the heads of negresses to the actual spot to which it is to be applied. In this way the manure is very thoroughly mixed, and the amount of the application is regulated by the number of baskets to the cane hole.

Surface drains are now dug two feet wide by one foot deep, thus forming the fields into beds 12 feet or 18 feet wide. In the flat lands these drains are dug with the slope of the land to take off the water, but, on the hills, across the slope, so as to catch the mould which would otherwise be washed away by the heavy rains.

The coral rock of which the sub-soil consists has, here and there, fissures, which are called "sucks," and to these the surface drainage leads. Where these are lacking, wells sometimes even as much as 100 feet deep are dug through the soil till the coral rock is reached, thus making artificial "sucks."

The land is now kept clean by "farming," a system by which a number of acres are handed over to a woman who is called a "farmer," and who, with her children, keeps the land free from weeds for a small weekly wage per acre.

On as many fields as the time for the operations of cultivation permits, a green dressing of some leguminous plant, *e.g.*, woolly pyroe, or Bengal bean, or a succulent plant such as the sweet potato, is grown and turned into the soil. Thus, between July and December, the land is got ready for planting.

Other fields are "thrown out," *i.e.*, they remain out of cane cultivation for eighteen months, from July of one year to the December planting season of the next year. On some of these, crops of sweet potatoes and other provisions are grown, for sale or home consumption, while on the rest, imphee, guinea corn, or maize for the stock.

In the middle of November the planting season commences. The plants consist of the green top portion of the stem of the cane, and are 9 or 10 inches long, each cane furnishing two plants. Usually certain fields have been reserved to be cut down for plants, the immature canes being crushed and the juice boiled to syrup for sale to the labourers. The plants are usually steeped in water for twelve hours, then carried out to the fields and dropped by children, one in each cane hole; the negro then following, makes a hole in the bottom of the cane hole with a short iron drill, thrusts in the plant nearly upright, and presses it down with his heel. It is most important that the plant should be pressed down to the bottom of the hole made by the drill, or it will be "hung," and water collecting in the hole beneath the plant will rot it before it can spring. Each plant consists of several joints, and each joint has an eye from which a young cane plant should spring. In January and February applications of so-called "planting in" manure are made; this consists of about fifty to sixty pounds of potash as sulphate, and fifty pounds of soluble or assimilable phosphate, or its equivalent in basic slag, per acre, with sometimes a small amount of nitrogen in the form of sulphate of ammonia. As the canes of the manured crop are reaped, gangs of negroes collect the dead leaves or "trash," carrying on their heads huge bundles in which the individual is entirely hidden and which look like moving hay cocks, to the fields of young canes, where they serve to shelter the plants from the sun and keep the moisture in the ground.

As soon as the old crop is finished, and the heavy rains have come in, in July (for the first six months of the year are usually dry), further applications of artificial manure are made to the young canes; this now consists generally of sixty pounds of nitrogen as sulphate of ammonia per acre, which, as in the case of the former application of cinereals, is applied with the greatest care, and under the closest supervision of managers and overseers, by children using an iron spoon or small tin vessel, with which a certain portion is applied to the side of each cane hole, according to the amount of the application required. Sometimes another thirty pounds of nitrogen, as sulphate of ammonia, is applied at the end of August. This is the plan followed in recent years on very many estates, but until a few years ago, the general custom was to apply the whole artificial manure in the form of a general manure containing 9% ammonia, 17% to 20% phosphates, and 7% or 8% of potash, at the rate of about a ton to 4 or 5 acres in July.

After the old crop has been reaped, on those fields which are to be kept for ratoons, as soon as possible a dressing of nitrogen, such as 1 cwt. of nitrate of soda or sometimes nitrate of potash, is applied, which starts the new growth in the old cane root, and later on, in July or August, a further application of nitrogen such as 2 cwt. of sulphate of ammonia, per acre.

During the earlier stages of the cane's growth when the first shoots, resembling coarse reeds, are springing, every here and there may be observed " a dead heart," *i.e.*, the top blades curled and brown. This is caused by the attack of the cane borer, the larval form of a night-flying moth (*Diatræa saccharalis*), on the first joints of the young shoot, causing the centre growing portion to die. Throughout the first six or seven months of the young cane's growth, a gang of old men is continuously employed going over the fields to cut out these shoots, which are immediately collected to be burnt or chaffed up. After this period the canes become so thick and interlaced that it is impossible for any one to go through them, and, moreover, the cane has attained such a size that the attack of the borer, though most prejudicial to both quantity and richness of the juice, does not kill it. The Imperial Department of Agriculture recently instituted by Mr. Chamberlain discovered that the eggs are laid in patches on the under side of the young blade, and these are now collected by the sharp eyed negro children, who are paid so much per hundred, and in this way many thousand eggs are destroyed. There is a fungoid growth (*Cordiceps*) which attacks the larva and completely fills its body with woody growth, also a parasitic fly which lays its eggs within the eggs of the moth, but these two natural agencies alone were not sufficient to prevent the increase of the borer. In consequence of the destruction of all ground lizards and ground nesting birds by the mongoose, introduced into the island from India to destroy the rats, the attacks of the borer reached alarming proportions. The tunnels made by the borer gave an easy entrance to the cane to the spores of a fungus (*Tricosphaeria Sacchari*), and this in the form of either " root " or " rind " fungus caused the loss of entire crops.

The attacks of the fungus have been combated not only by destroying the eggs of the moth borer, but also by the introduction of new varieties of " seedling " canes. Until about 15 years ago the formation of fertile seed by the sugar cane was almost unknown. The simultaneous independent discoveries of the possibility of this by Messrs. Harrison and Bovell in Barbados, and Dr. Soltwedel in Java, opened a wide channel for the improvement of the sugar cane by seed variation, and now the Department of Agriculture for the West Indies each year raises many thousands of seedlings which take two years to arrive at maturity. Most of them are of no value, but already a few have proved themselves worthy to take the place of the old Bourbon cane, which, after being for more than a hundred years the best, one might almost say the only cultivated cane, throughout the greater portion of the sugar cultivation of the world, has with strange rapidity lost vigour and shown itself unable to resist the attacks of disease. The whole cane cultivation of Barbados now is practically carried on by means of seedling canes which though not yielding the quantity or the quality of juice the old Bourbon cane did in its best days, yet have the vigour to resist disease and to ratoon successfully.

Mr. Chamberlain has done a service for the West Indian colonies for which they must ever be grateful in the institution of the Imperial Department of Agriculture, whose province it is to solve the many intricate problems of agricultural science in the West Indies, which it is impossible for the individual planter to attempt to elucidate. I have pointed out a case in the discovery of the eggs of the moth borer where the Imperial Department has been of great benefit to the planters, and there can be no doubt that, just as the sugar beet has been improved by seed selection on the Continent from a root containing 5 % to one containing 20 % of sucrose, so in time new varieties of sugar cane will be found far more profitable than those at present known to us. The Department also gives most valuable lectures on the various branches of agricultural science. It is satisfactory that these are attended by large numbers of planters, and it is only to be wished that similar Departments of Agriculture could be established in every county in England, and that the farmers could be induced to benefit by the teachings of agricultural science as the planters of the West Indies are already doing.

The planters of Barbados have had in recent years a far harder stauggle than the farmers in the mother country, for they have had to combat a hurricane which devastated many of their fields and injured their works, and insect and fungoid attacks on their crops which have entirely destroyed the plant on which their whole system of agriculture was founded ; and to all these troubles have been added the low prices entailed by the building up in Continental countries of a vast industry of sugar beet cultivation by giving bounties on all sugar exported to England, amounting in some cases to 60 % of the value of the sugar, with the avowed intention of crushing the sugar industry in British colonies that they might thus be left without competitors.

George Carrington, B.A., F.H.A.S., F.C.S.

R.A.C. THEATRICALS.

On Tuesday, December 3rd, I had the honour, for the first time, of being one of the audience at the Dramatic Entertainment given by the Students at the Royal Agricultural College, being bidden thereto by the Principal, Professors, and Students of that College.

In the first place, let me thank all concerned for the very excellent evening's entertainment which was given me, and next let me tender my hearty congratulations to all—actors, stage manager, stage carpenters, scene painter, scene shifters, prompter, property men, and the like—on the success which crowned their efforts. I have heard that it is not an easy matter to produce a play, even with everything to hand, such as trained actors and actresses, an up-to-date theatre with all its appliances for lighting the stage and setting the scenery, and the assistance of the author of the play to interpret his writings. All credit, then, to those gentlemen who transformed the Dining Hall of an Agricultural College into an excellent little theatre and gave us such excellent stage pictures, and also to those who transformed themselves into excellent ladies, and with the rest of the cast gave some very clever performances in those pictures.

The only thing which did not please me was the play itself. I thought it poor and heavily weighted with long soliloquies of a more or less "moralising" tendency, the dialogue was neither remarkable for wit or humour, and the "situations" struck me as rather feeble. In spite of all this the actors made it go, and all their efforts were so admirable that one could not help wishing them a better play.

The four leading characters, Miss Charlotte Russe (Mr. Ashton Smith), Martha Bunn (Mr. C. F. A. Cooper), Sam Winkle (Mr. J. M. Bateman), and Sir Everton Toffee (Mr. C. R. Cocks) were all exceedingly well played. Mr. Ashton Smith gave a really excellent performance, his repose and "manner" on the stage being quite remarkable. Mr. Cocks, as Sir Everton Toffee, struggled with an impossible part, and is heartily to be congratulated on his efforts. Messrs. Bateman and Cooper gave two very clever performances, and were responsible for most of the fun of the play. Mr. Bateman was quite funny, and if instead of working quite so hard he would give his efforts a little more time, and have more repose, he would gain twice the effect. As it was, however, he was genuinely funny, and his efforts were greatly helped by Mr. Cooper. Mr. R. H. Keane, as Parsley, had such an excellent make-up that one would have liked to have heard more from him; the "talking" of the servants was mainly done, however, by Strap (Mr. F A. Osmond Smith), who, coming on with a fierce and determined aspect, fired off a long string of local jokes, which might perhaps with advantage have been curtailed (an opinion which his fellow servant Parsley seemed to hold).

The other parts were filled by Messrs. Conant, Farwell, Stockwell, Whitehead, and Ermen, the two last named being excellent representations of an "upper" and "lower" housemaid.

Between the acts Messrs. Walford and Wooldridge gave some excellent songs to the accompaniments of Mr. G. P. Harben.

Mr. Bonnin is to be heartily congratulated on the success of his hard work as stage manager, the "Ladies" are to be heartily congratulated on the excellence and imposing effect of their frocks, Mr. Paton is to be heartily congratulated on his efforts as a scene painter, and my hearty congratulations to all who had anything to do with the R.A.C. Dramatic Entertainment. A VISITOR.

INDUSTRIAL AND LOAN EXHIBITION.

The fourth exhibition of this kind was held in the Corn Hall of Cirencester, from November 12th to 21st. The first exhibition was held in 1887. The number and quality of the exhibits was an improvement on each of the former exhibitions. The College was represented to some extent by Professor Kinch on the working committee and Professor West among the judges; also, among the winners of prizes, by Mr. G. P. Harben in the fine art department, for water-colour sketches of Cornish scenery, and by Esau Terry, in the industrial department, for wood-carving.

ENTERTAINMENT BY THE R.A.C. STUDENTS.

On two evenings, November 19th and 20th, the students of the R.A.C. provided the entertainment, which consisted partly of a concert and partly of a dramatic performance by the R.A.C. Dramatic Club. Messrs. Harben and Bonnin and all the performers are to be congratulated on what was in everybody's opinion an entirely successful entertainment. The great feature of the concert was undoubtedly Mr. Walford's comic songs, which were received with great enthusiasm; as he was encored repeatedly he had to give at least six songs; perhaps the favourites among these were "O be careful," and "A little bit farther on." Professor Wooldridge sang "John Bull," but he certainly reserved the best till last, when he sang, "The Admiral's broom" as an encore, a song which it is always a pleasure to hear, especially when sung so well as it was on this occasion. Mr. Beddall sang "Motherland," from "San Toy," with great success; indeed his voice is quite good enough to justify his attempting songs of higher artistic merit than the one he gave us. Mr. Huddart sang a plantation song, and a very pretty telephone song, "Hello, my baby," which was much appreciated. The instrumental part of the concert was provided by Messrs. Scully and Cooper, in the form of banjo solos and duets, all of which were played cleverly. The thanks of both performers and audience are due to Mr. G. P. Harben, who played the accompaniments in every case.

The play given by the Dramatic Club was "The Duchess of Bayswater and Co.," a comedietta by A. M. Heathcote. A better play for the purpose could hardly have been selected; the only fault to be found was that it was perhaps rather too short. Mr. Bonnin as the Duchess was really admirable; her aristocratic manners, combined with an approach to, though never really reaching, vulgarity, could hardly have been better done. Mr. Hartley as Kathleen looked quite charming, and acted very cleverly; his voice, however, rather destroyed the illusion, as he lacks Mr. Bonnin's power of raising it above its natural pitch. Mr. Bateman, in Sir Jeremy, had a very difficult part, which he played excellently; it is not too high praise to say that his acting was as good as Mr. Bonnin's. The Duke of Bayswater was played by Mr. Harben with great success; the College has certainly never seen him in a part that suited him so well. Mr. Walford, who played Caryl Stubbs, was not so fortunate in his part, which was not one calculated to bring out his special powers; however, he gave us a careful piece of acting, playing well up to Kathleen in his scenes with her. The part of Jenkyns, Sir Jeremy's attendant, was very adequately taken by Mr. Farwell.

At the close of the performance, the Duchess, who was called upon for a speech, said how very glad we were of such occasions for promoting the good feeling which we believe does at present and we hope will continue to exist between the town and the R.A.C.

Mr. Bonnin also acted as stage manager in a very efficient manner. The following is the full cast :—

Sir Jeremy Joles (a Valetudinarian)	Mr. J. M. Bateman.
The Duke of Bayswater	Mr. G. P. Harben.
Caryl Stubbs (a young millionaire, son of "Stubbs's Tinned Meats"	Mr. E. Walford.
Jenkyns (Sir Jeremy's attendant)	Mr. E. W. Farwell.
The Duchess of Bayswater (mother to the Duke)	Mr. H. A. V. Bonnin.
Kathleen (Sir Jeremy's daughter)	Mr. R. Hartley.

Place ... The Hotsprings Hotel, Siplock, Derbyshire.
Time ... The Present.

This piece was performed by the R.A.C. Dramatic Club in 1892 (Vol. VI., p. 56), but it was decided by those who had the opportunity of seeing both that the present performance was an advance on the former.

THE ROYAL AGRICULTURAL COLLEGE CLUB.

The Annual Dinner was held at the Holborn Restaurant on Wednesday, December 11th, Mr. E. B. Haygarth in the chair. The following members and visitors were also present: Messrs. C. Bathurst, C. J. Bennett, G. S. Bisdee, E. C. Cripps, R. D. Cumberland-Jones, T. A. Dickson, Edwin Fox, W. T. Hall, F. E. Harman, J. T. Hobbs, Kenyon-Musgrave, A. G. Scorer, J. H. Simpson, J. Herbert Taylor, J. G. Turnbull, S. R. Vernon, H. C. Waterfield, H. M. Webb, A. Weigall, &c. After the usual loyal toasts, the Chairman proposed the Army, Navy, and Auxiliary Forces, and in so doing paid a warm tribute to those Old Students who had made great sacrifices for the service of their country both at home and in South Africa, and mentioned the names of several who had lost their lives in the war. He coupled with the toast the names of Captains Weigall and Vernon, who duly responded. Mr. Cumberland-Jones proposed "Success to the R. A. College," and remarked in so doing upon an interesting and recent success at Smithfield Show by Mr. A. G. Scorer, an Old Student who was present at the dinner, and whom he congratulated upon having taken first prize and breed cup for his Red Polled steer. The Chairman responded to the toast, and upon the conclusion of a pleasant evening, interspersed with some good songs, Mr. A. Weigall was elected President for 1902.

SURVEYORS' INSTITUTION.

In addition to the old Students mentioned in the last number as having passed examinations of the Surveyors' Institution, Leonard Eustace Salt, M.R.A.C. (1895), obtained the Professional Associateship, and Lancelot Goulder Hawkins (R.A.C. 1896) passed the Fellowship examination. Mr. M. M. Holl, M.R.A.C., and Mr. H. A. C. Warmington, M.R.A.C., have been duly elected Fellows of the Institution.

AT THE FRONT.

R. C. Butler, Warren's Mounted Infantry (Defence Force).

C. Giffard Jeffery, R.A.C. (1898), Lance-Corporal Volunteer Company Princess of Wales's Own Yorkshire Regiment, has received a commission as Second Lieutenant in the same regiment, on the nomination of the Commander-in-Chief in South Africa. (See p. 23.)

OBITUARY.—We regret to record the death of Alexander Crossley Cunningham, killed in action near Smithfield on October 26th. Mr. Cunningham was a student during 1897 and till April, 1898 : he was in the Cricket XI. 1897, and in both the Rugby and Association Football teams. He entered the Army in the 3rd Battalion Argyll and Sutherland Highlanders, and was made Lieutenant February, 1900. From this he joined the 20th Company—Fife and Forfarshire Light Horse—Imperial Yeomanry.

OLD STUDENTS.

Mr. Harold C. Salt (R.A.C. 1894-1895) has been appointed agent to Mr. Mervyn Wingfield, Barrington Park, Burford, and will enter upon his duties at the new year.

Mr. E. C. Ozanne, M.R.A.C., of the India Office, has been appointed on the International Commission on Sugar Bounties, to meet at Brussels early in the New Year.

DIPLOMA EXAMINATION.

At the Diploma examination at the end of last Summer Session, the Diploma of Membership, with honours, was obtained by Messrs. H. T. G. Blaauw, B.A., G. S. Bisdee, H. J. J. Patten, and A. Gawthropp. Messrs. Blaauw and Bisdee gained Gold Medals, and Mr. Patten a Goldstand Silver Medal. The external examiners were :—In Agriculture, Mr. J. Nunnerley; in Agricultural Chemistry, Dr. J. A. Voelcker; in Veterinary Science and Practice, Sir George T. Brown, C.B. ; and in Practical Engineering, Prof. H. Robinson.

SCHOLARSHIPS.

The First and Second Scholarships were divided between M. P. Salvago and H. B. Beddall. The Third Scholarship was awarded to W. W. Bell. Proxime Accessit :—Sparrow, Lindsell, Husain, and Lambert.

COMPETITIONS.

The Butter-making Competition took place on December 3rd. W. Thompson gained the prize.

The Ploughing Competition took place on December 6th. The first prize was won by Sandford, and the second by Conant.

AGRICULTURAL EDUCATION.

At a meeting of the Cirencester Chamber of Agriculture, held on November 25th. Mr. J. C. Medd, M A., gave a most interesting address on Agricultural Education, and very fully and ably explained the scheme of the Agricultural Education Committee. He mentioned that it was the predecessor of the Chamber, viz., the "Cirencester and Fairford Farmers' Club," which initiated the movement resulting in the foundation of the Royal Agricultural College nearly sixty years ago, so it was appropriate that the Chamber should take an early opportunity of expressing its opinion on more recent pioneer work. At the conclusion of Mr. Medd's address, Professor Kinch made a few further remarks on the aims, methods, and the principles that guided the Committee, and proposed a resolution to the effect that "This Chamber is in full sympathy with the efforts of the Agricultural Education Committee for the Promotion of Agricultural Education, and urges the Board of Agriculture to undertake the systematic organisation of such education, for which purpose it is essential that larger funds be placed at its disposal." This was seconded by Mr. J. M. White and carried unanimously.

CHLORINE IN RAINWATER.

The rainfall for the six months ending September 30 was 14·62 inches, falling on 70 days: it contained, as a mean, chlorides equal to ·302 grains of sodium chloride per gallon, and this is equivalent to a deposit of 14·27 lbs. of common salt per acre. For the twelve months to the same date the rainfall was 29·94 inches on 174 days and the chlorides equivalent to a deposit of 33·87 lbs. of common salt per acre.

E. K.

CRICKET.

[The following was held over from last number, being too late for publication.]

R.A.C. v. CHELTENHAM TOWN.—Played on July 31st, at the R.A.C. This match ended in a draw rather in favour of the visitors. We batted first with Darling and Conant; the latter only made 4, but upon Harben joining Darling some splendid cricket was seen, and we seemed in for a good score when the latter was caught for a well-played 31. Stenhouse then joined Harben, the score going up at a good rate, but when Harben left no one made much of a stand. Irwin's patient 17 was invaluable, as it gave Stenhouse time to complete his century, which was received with great cheers; it was a grand display of batting. The visitors commenced painfully slowly, never showing any inclination to force the game. For the visitors Mills bowled well, as also did Darling and Varley for the College. Score:—

R.A.C.	
L. J. Darling, c Pemberton, b Mills	31
M. V. Conant, c Borroughs, b Mills	4
G. P. Harben, c Norman, b Mills...	35
S. Burrell, b Mills	0
V. D. Stenhouse, not out	112
Varley, c Borroughs, b Hodgkins ..	7
E. Walford, b Mills...	0

CHELTENHAM.	
C. S. Barnett, l-b-w, b Varley ...	21
Borroughs, c Stenhouse, b Darling	24
E. Barnett, not out	62
P. Hodgkins, st Walford, b Darling	4
O.W. T. Jessop, c Lindsell, b Darling	33
Mills, not out	0
G. Norman, did not bat.	

G. J. Wilson, b Hodgkins	0
P. J. Lindsell, l-b-w, Dighton ...	14
F. H. O. Smith, st Borroughs, b Dighton	0
M. F. Irwin not out...	17
Extras	7
Total (9 wickets)	227

F. M. Norman A. A. Dighton E. Pemberton C. A. A. Dighton	Did not bat.
Extras	8
Total (4 wickets)	154

R.A.C. v. CIRENCESTER AND DISTRICT.—Played at the R.A.C. on August 3rd, 1901. Cirencester had gone a long way round to get an XI. to oppose us, only seven Town men playing. We made a good start, but were unable to maintain it. Fawcett and Allen played a very good game, each hitting hard, but giving several chances which were not accepted. C. O. H. Sewell captained the Visitors' team, in the absence of Boulton, and owing to his unselfishness, we did not have to field against him. Varley bowled exceedingly well. When we went in to bat no one could make a show at all, Stenhouse being badly run out when apparently well set. The other batsmen did not seem to relish Tovey's "short 'uns," and Giles was much too good, his length and change of pace being very deceptive. Score:—

CIRENCESTER AND DISTRICT.	
T. Garne, c Walford, b Varley ...	0
G. Winstone, c Stenhouse, b Darling	39
E. Fawcett, c Lindsell, b Darling...	54
C. Allen, not out	113
W. G. Tovey, b Varley	9
C. Smith, run out	14
W. May, c Varley, b Darling ...	12
R. W. Ellett, b Harben	1
A. Prout, not out	15
C. O. H. Sewell Giles	Did not bat.
Extras	1
Total (7 wickets)	258

R.A.C.	
L. J. Darling, c Fawcett, b Tovey	7
M. V. Conant, b Tovey	10
G. P. Harben, c Garne, b Giles ...	1
S. Burrell, b Tovey	0
V. D. Stenhouse, run out	15
Varley, b Giles	4
E. Walford, b Tovey	6
G. J. Wilson, c and b Giles ...	13
P. J. Lindsell, run out	1
M. F. Irwin, not out	7
R. Ratcliff, b Fawcett	0
Extras	10
Total	83

BOWLING AVERAGES.

	Overs.	Maidens.	Wickets.	Runs.	Averages.
L. J. Darling ...	117	9	23	386	16·2
Varley	272	59	43	707	17·16
V. D. Stenhouse ...	36	2	10	190	19·00
G. P. Harben ...	185	36	23	722	31·9

The following also bowled, but are not qualified for average: W. H. Parker, M. V. Conant, F. H. O. Smith.

BATTING AVERAGES.

	Runs.	Most in an Innings.	Times not out.	No. of Innings.	Averages.
V. D. Stenhouse ...	308	112	1	12	28·00
G. P. Harben	188	36	0	14	13·6
L. J. Darling	144	31	0	14	10·4
M. F. Irwin	40	17*	5	7	20·00
S. Burrell	103	31	2	13	10·3
M. V. Conant... ...	92	29	0	12	7·8
E. Walford	95	19	1	14	7·4
P. J. Lindsell... ...	56	21	2	10	7·00
G. F. Wilson	78	19	0	12	6·50
R. Ratcliff	27	6	1	10	3·00
Varley	77	27	2	13	7·00

* Not out.

The following also batted, but are not qualified for average: W. H. Parker, R. Stuart, R. C. Barton, S. Hancock.

STEEPLECHASE.

The Steeplechase was run on Friday, December 6th, over a rather heavy course of over two miles on the College Farm. The entries were fewer than usual, and only three competitors finished, H. B. Beddall being a good first, whilst F. Scully and R. Hartley ran close for the second place, which Scully managed to keep.

FOOTBALL.

RUGBY.

CHARACTERS OF THE TEAM.

H. B. BEDDALL.—Has been the mainstay of the forwards throughout the season. Makes use of all his weight, is always on the ball, good collar, good kick.

E. M. WASON.—A very good forward, works hard, very good out of touch; his dribbles have been remarkable in every game.

R. H. KEANE.—Has made an excellent captain. A hardworking and energetic forward, whose efforts deserve to have been more often crowned with success.

H. A. V. BONNIN.—Has played a very good game as wing-threequarter this year; is very fast. Unfortunately got injured early in the season.

G. J. WILSON.—Has played extremely well at half-back all the season; he is always quick in getting to his man, and his punts have been very remarkable. Since last year he has learnt to feed the threequarters, and his passes are smart and straight.

R. C. BARTON.—A very plucky, unselfish half-back, always plays a hard game, saves well and is a smart tackle.

W. H. PARKER.—Is a promising forward, good out of touch, strong runner; goes for his man low and never misses him.

E. WALFORD.—A good centre threequarter; has scored most of our tries this season by his fast tricky runs, but unfortunately does not always bring his man down. He is very clever at intercepting.

S. BURRELL.—Shows up well as a hardworking forward; collars well, good drop kick. Had to play back on a few occasions.

J. R. EDDISON.—A good heavy forward, useful with his feet in the loose, very sharp out of touch.

G. W. O. HUDDART.—Does much work in the scrum, always plays a hard game, and saves well.

F. WHITEHEAD.—Has improved greatly since last year as a threequarter, but is rather inclined not to mark his own man.

F. SCULLY.—Has come on wonderfully as a wing threequarter since the beginning of the season. Is an extremely good fast runner; he will be good when he learns to collar low.

T. A. SCULLY.—A big forward; dribbles well, good out of touch, but owing to not knowing the game well does not make full use of his weight in the scrum.

C. R. COCKS.—Played back towards the end of the season; goes for his man high, but invariably brings him down. He must learn to kick and make touch.

Also played frequently.

P. J. LINDSELL.—A fast runner; played both back and threequarters. He would be much better if he always put a little more heart into the game.

T. W. DAVIES.—A heavy forward, rather slow, and not too fond of hard scrummaging.

G. A. LAMBERT.—A light but energetic forward, rather inclined to wing.

E. Iredale.—A promising forward ; showed great signs of improvement towards the end of the season.

Our thanks are due to F. H. Smith, who kept the line for us in every match.

R.A.C. v. St. Paul's Training College (Cheltenham).—This match was played at Cheltenham on October 19th. Keane having lost the toss kicked off from mid-field, the ball being returned to our 25, where a series of scrums ensued. Eventually G. J. Wilson obtained possession, and transferring it to Walford the latter almost scored, being brought down about three yards from our opponents goal line by their full back. A few minutes afterwards Edwards scored for Cheltenham, having succeeded in intercepting a pass ; the try was not converted. Shortly after this, one of our opponents dropped a very neat goal, the score at half-time thus being 7 points to *nil.* On resuming, the R.A.C. pack pulled themselves together, and the game was carried into our opponents' 25. Just before the close of the game Beddall scored a beautiful penalty goal. The match thus resulted in our defeat by 7 points (1 try and 1 dropped goal) to 3 (1 penalty goal). Our forwards packed very badly, and this probably was the cause of our defeat. The best of our forwards were Keane, Beddall, and Parker ; Barton played a very good game at half, and Burrell was fairly successful at back, but failed to make touch. The threequarters failed badly with the exception of Walford, who played well. Team : Burrell, back ; Bonnin, Walford, Lindsell, F. Scully, three-quarters ; Wilson and Barton, halves ; Keane, Beddall, Wason, Parker, Eddison, Huddart, T. Scully, and Sherston, forwards.

R.A.C. v. Berkshire Wanderers A.—This match was played at Reading on October 23rd, and resulted as follows : Berkshire Wanderers, 10 points (2 goals) ; R.A.C., 6 points (2 tries). In this match Lambert and Davies displaced Sherston and T. Scully, but the change did not appear to strengthen our pack. Going away with a rush, the College scored in the first seven minutes, Walford obtaining a try which Beddall failed to negotiate. Play settled down in mid-field, but Walford, getting possession, again scored, Beddall failing to add to the points from a somewhat difficult angle. The score at half-time was 6 points to *nil.* In the second half our opponents scored twice, the tries being converted each time. Beddall, Wason, and Eddison were the most conspicuous forwards ; at half-back, Barton tackled splendidly, and Wilson's long punts were most successful ; of the three-quarters Bonnin and Walford were undoubtedly the best. Team :—Back, Burrell ; three-quarters, Bonnin, Walford, Whitehead, and F. Scully ; halves, Wilson and Barton ; forwards, Keane, Beddall, Wason, Parker, Eddison, Huddart, Lambert, and Davies.

R.A.C. v. Gordon Wanderers.—Played at Cheltenham on October 26th, and resulted in a win for the home team by 36 points to 3. A few minutes after starting, the halves obtained possession of the ball, and transferring it to Walford, the latter scored a good try after a brilliant run. After a series of scrums in the middle of the field, the Wanderers succeeded in rushing the ball over ; the try was not converted. The home team now scored rapidly, and when no-side was called the Wanderers were easy victors as before stated. The result was due to the three-quarters failing to mark their men and never collaring low. Walford and Bonnin were the best three-quarters, Whitehead playing a most indifferent game. Barton at half played a remarkably good game, tackling well. Of the forwards, Beddall, Parker, and Wason were the best ; Davies and Lambert appeared quite unable to get into the scrum. Our team was handicapped by the absence of our captain, who had unfortunately injured his knee. Team : Burrell, back ; Bonnin, Walford, Whitehead, and F. Scully, three-quarters ; Wilson and Barton, halves ; Beddall, Wason, Parker, Eddison, Huddart, Lambert, Davies, and Iredale, forwards.

R.A.C. v. Cheltenham Wednesday.—In this match, which was played on the 30th October, Lindsell replaced Burrell at back, the latter going forward. Lindsell acquitted himself very creditably, saving well on several occasions. This match was far more evenly contested than it appears to have been from the score, which was mainly due to failure of the three-quarters to collar their men. T. Scully scored for the College from a line out from touch, Beddall failing to convert. The Wednesday team scored 4 tries and a goal, thus winning by 17 points to 3. The College halves both played a fair game, Wilson's punts being most useful and Barton's collaring being very good. Beddall, as usual, played a sound defensive game, Keane being very good in the open. Burrell, Parker, and Wason also played well. Team: Lindsell, back; Bonnin, Walford, Whitehead, and F. Scully, three-quarters; Barton and Wilson, halves; Keane, Beddall, Wason, Parker, Eddison, Huddart, T. Scully, and Burrell, forwards.

R.A.C. v. CHELTENHAM A.—Played 2nd November. This was the first home match of the present season, and a large number turned out in the hope of seeing the College win. The result was somewhat disappointing, our team being defeated by 12 points to 3. In this match Huddart replaced Bonnin at three-quarters owing to the latter being hurt, Iredale going forward in Huddart's place. Early in the game F. Scully scored on the extreme left; the try was not converted. The visitors retaliated by scoring a converted try and a dropped goal in the first half, and in the second half they obtained another try. Lindsell, who had played so well in the previous match, was a complete failure at back. F. Scully and Walford played well at threequarters, and Keane, Wason, and Iredale played a good game forward. Team: Lindsell, back; Huddart, Walford, Whitehead, F. Scully, threequarters; Wilson, Barton, halves; Keane, Beddall, Wason, Parker, Eddison, Burrell, T. Scully, Iredale, forwards.

R.A.C. v. CHELTENHAM COLLEGE.—Played at Cheltenham College on November 13th, and resulted in a win for the home team by 8 points to *nil.* Burrell was in his old position at back, and Lindsell replaced Huddart at three-quarters. The whole team gave a most creditable display, considering the sticky state of the ground, and the fact that the game was played during a deluge. Burrell played well at back, Walford, Wilson, and T. Scully also doing good work. Team: Burrell, back; F. Scully, Irwin, Walford, Lindsell, threequarters; Barton, Wilson, halves; Keane, Beddall, Wason, Huddart, Parker, Eddison, T. Scully, Lambert, forwards.

R.A.C. v. BATH COLLEGE.—This match was played at Bath on November the 30th, and resulted in an easy win for the R.A.C. by 45 points to *nil.* Bath College were outclassed everywhere, especially behind the scrum, where the threequarters and halves had some very pretty passing. Walford opened the score for the College by a very smart run; Keane failed to convert. After some forward play in our opponents 25, Wason scored from a line out; Harben failed to convert at a difficult angle. Half-time score was 1 goal 4 tries to *nil.* On recommencing play Bath College made a determined rush, but Harben saved and passed to Wilson, who put in one of his useful punts. After this we scored frequently, our opponents offering very little opposition; we continued to press for the remainder of the game. The following played well: Wason, Harben, Walford, Wilson, and Barton. Tries obtained by Walford (3), F. Scully (3), Harben (1), Wason (1), Wilson (1), Barton (1), T. Scully (1); Keane converted six tries. Team: Cocks, back; Harben, Walford, Whitehead, and F. Scully, threequarters; Barton and Wilson, halves; Keane, Wason, Parker, Huddart, Burrell, T. Scully, Iredale, Browne, forwards.

The Football Kicking Competitions took place on December 4th, under favourable climatic conditions. The prizes were won by Parker for the place kick, Keane for the drop kick, and Burrell for punting. Professor West very kindly acted as judge.

ASSOCIATION.

R.A.C. v. TOWN.—This match was played on December 7th, on the Town ground, and resulted in a win for the Town by 3-2. The Town won the toss and elected to play with the wind. A good run by Salvago and Bell in the first ten minutes resulted in a goal for the R.A.C., which was neatly put through by Bell;

the Town, however, were not slow in equalizing matters. The College again scored shortly afterwards, but the Town, by superior combination, got on terms, and at half-time the game stood at 3 to 2 in the Town's favour. In the second half, Prof. Wooldridge repeatedly kept the Town out, and the R.A.C. once or twice looked like scoring. No further goals, however, were scored by either side. Team: Goal, Irwin; backs, Prof. Wooldridge and Parker; half-backs, Bateman, Walford, Ratcliff; forwards, Salvago, Bell, F. Scully, Harben, T. Scully.

GOLF.

STAFF v. STUDENTS.—Played at the College November 2nd, 1901.

STAFF.		STUDENTS.	
G. Paton	0	J. R. Eddison	0
E. B. Haygarth	8	W. Thompson	0
E. Blundell	2	W. W. Thompson	0
R. Swanwick	0	G. F. Sandford	1
G. L. Locke	5	R. Stuart	0
G. H. Wooldridge	4	N. Robinson	0
G. S. West	0	M. F. Irwin	4
	19		5

R.A.C. v. SAPPERTON PARK.—Played at the College on Wednesday, December 4th.

R.A.C.		SAPPERTON PARK.	
Prof. Paton	0	J. Rawlins	3
,, Haygarth	—	E. C. T. Dodd	—
,, Blundell	0	H. G. Rawlins	5
,, Locke	0	R. Anderson	0
,, Wooldridge	0	R. J. Mullings	1
W. W. Thompson	3	E. Cripps	0
W. Thompson	1	G. P. Smith	0
J. R. Eddison	0	E. C. Sewell	3
	4		12

CUP COMPETITION.

Played 15th November, 1901. The Senior Cup was won by W. Thompson, and the Junior Cup by Irwin.

SENIOR.		Hcp.		JUNIOR.		Hcp.	
W. Thompson	93	11	82	Prof. Wooldridge	107	16	91
Prof. Blundell	94	6	88	N. Robinson	116	16	100
W. W. Thompson	100	11	89	M. F. Irwin	98	17	81
Prof. Paton	90	0	90				
Prof. Locke	101	9	92				
E. B. Haygarth	96	0	96				
Prof. West	113	12	101				

BILLIARDS.

A "Roberts" cue was presented by the In-Staff for competition by the In-Students of Class IV. There were sixteen entries, and after a number of very keenly-contested games Mr. M. P. Salvago proved the successful competitor.

The following gentlemen entered for the American Billiard Handicap of 200 up:

Prof. Paton ...	... scr.	W. W. Thompson ...	35	E. L. Gruning ...	60
M. P. Salvago ...	10	Prof. West	35	G. F. Sandford ...	60
J. W. Aspinall ..	15	S. Burrell	35	Prof. Wooldridge ...	70
Prof. Locke ...	20	W. H. Parker ...	50	F. Whitehead ...	75
M. F. Irwin ...	25	H. B. Beddall ...	50	M. V. Conant ...	80
J. M. Bateman ...	30	F. H. Smith ...	50	C. E. Ermen ...	80
P. J. Lindsell ...	35	E. W. Farwell ...	60	G. J. Wilson ...	100

First prize, S. Burrell; second prize, J. M. Bateman; third prize, Prof. Wooldridge.

REVIEWS.

Journal of the Department of Agriculture of Western Australia. August, 1901; Vol. IV., Part 2. 2s. 6d. per annum.

In a previous number of the *Gazette* attention was directed to the usefulness of these local journals to those interested in colonial life, and an excellent example will be found in the August number of the *Journal of the Department of Agriculture of Western Australia.* It contains many articles of interest, a notable feature being the excellence of the illustrations. The question of Rabbit Control and Destruction is discussed, the relative merits of different poisons and traps being dealt with at considerable length, for "the rabbit pest can only be likened to and dealt with successfully as a fire." A series of papers on the general principles of pruning vines and fruit trees is continued in an article on the methods of pruning specially adapted for particular trees. A circular letter written by the Secretary of the Department of Agriculture deals with the prevention of disease in vineyards and orchards; local societies are asked to appoint honorary inspectors to assist the Department in administering the Insect Pests Act. The Cultivation of Sweet Potatoes, Pig Feeding on Purchased Foods, and Amateur Wine Bottling are among the subjects dealt with in the August number.

Notes on the Cattle of the Madras Presidency. By J. D. E. Holmes, M.A., M.R.C.V.S., Department of Land Records and Agriculture, Madras. Vol. II., Bulletin No. 44.

Apart from the herds of mongrel cattle found in the villages throughout India, many distinct breeds of very fine cattle exist in the Presidency of Madras. In this bulletin they are classed under three types—the Nellore, which are indigenous, the Mysore, which are said to owe their origin to cattle brought by Nomadic tribes from the North, and the Kongu, which are derived from a cross between animals of the Nellore and Mysore types. The reports of the Stock Inspectors are quoted to illustrate local customs. Little attention seems to be given to the cows; they are kept chiefly for breeding purposes, but, except among the Nellore breeders, little effort is made to improve the breeds or to keep them distinct. It seems a pity that in 1889 the Government ceased to give any encouragement to systematic breeding, though the aid previously given was much appreciated by the ryots. To English readers the chief interest in this paper lies in the description of a state of things so different from our own; the main object of the ryot of Madras in keeping cattle is the supply of bullocks, which are put to a number of uses, such as working in carts and at water-lifts and oil-mills. A curious custom is the Gooli Eruthu: when a rich man dies, his relatives give a bull for the benefit of his soul; the animal is set free with religious ceremonies, and is then allowed to wander at large. The fact that the bull becomes common property can hardly compensate for the damage which he inflicts upon the crops. An exhaustive account is given of the distinctive characteristics of the principal breeds, and this is supplemented by tables of measurements.

GT

OF
JUL 15
D

NEW SERIES.

Agricultural Students' Gazette.

VOL. X. APRIL, 1902. No. 6

Obituary.

LAWES AND GILBERT are gone, but their work remains, and the fruits of it will remain for ages, even when the granite monument erected to commemorate fifty years of their joint work shall have crumbled.

Lawes and Gilbert were united in their lives and in their work for fifty-six years, and divided by death but for a few months; they now rest together in the little churchyard of Harpenden.

John Bennet Lawes died at Rothamsted on August 31st, 1900, at the age of 85; and Joseph Henry Gilbert died at Harpenden on December 23rd, 1901, at the age of 84.

An obituary notice of Sir J. B. Lawes, with a photogravure portrait of great excellence, appeared in our issue for December, 1900.

Joseph Henry Gilbert was born at Hull, August 1st, 1817; the son of a Nonconformist minister. His mother, Ann Gilbert, was the daughter of the Rev. Isaac Taylor, and was the authoress of numerous poems for children. Whilst at school Gilbert met with a gunshot accident by which he practically lost the use of one eye; this was at times a very real hindrance to him, though his great pluck rarely let it be noticed. From school he went to Glasgow University, and studied chemistry under Dr. Thomas Thomson; thence to University College, London, where, in the laboratory of Dr. Antony Todd Thomson, he first met as a fellow student with John Bennet Lawes. Afterwards Gilbert went for a short time to the University of Giessen, where Liebig was then Professor of Chemistry, and here he took the degree of Ph.D. in 1840. He then became for a time assistant to Dr. A. T. Thomson at University College, but in 1841 went to the neighbourhood of Manchester to study calico printing and dyeing. In June, 1843, the decisive action of his life was taken when he became technical adviser and collaborator with Mr. J. B. Lawes at Rothamsted. Thus when under twenty-six years of age he began the life-long and unbroken collaboration which terminated only with the death of Lawes in August, 1900. Gilbert lived at Harpenden, near the Laboratory. He was twice married: in 1850 to Miss Laurie, who died in 1852; and in 1855 to Miss Maria Smith, the present Lady Gilbert, who was a devoted help-mate. Together Lawes and Gilbert will go down to posterity as a combination without parallel in its duration, in its work, and in its influence on agriculture and agricultural chemistry. Each supplied what the other needed, and the result of the combination is partly recorded in the 132 papers published in the *Philosophical Transactions* and *Proceedings of the Royal Society, Journal of the Royal Agricultural Society of England, Journal of the Chemical Society, Agricultural Students' Gazette*, and other journals and papers; partly in the 50,000 specimens of soils, crops, ashes, &c., in the Laboratory; partly in the experimental fields at Rothamsted; and largely in the agriculture of the world. Lawes was the practical agriculturist, possessing an original mind, versatility, and a very sound judgment. Gilbert had a more exact knowledge of science and its methods, an acquaintance with foreign workers and literature, very methodical habits, and great power and perseverance in working. The preparation of the voluminous memoirs and papers emanating from Rothamsted fell mainly on Gilbert, as did the production and distribution of the "Memoranda" and Field Guide to the Field and other Experiments, issued annually. Gilbert's holidays, too, were often used in expounding and diffusing knowledge of the Rothamsted experiments at the British Association, at Conferences in Germany or France, or in lectures in the United States and Canada.

Among the numerous joint papers of Lawes and Gilbert very many will always remain classical, and it is almost invidious to select any for special mention, but of special value are those relating to the question of the sources of Nitrogen of Vegetation: the first series of these were published in the *Proceedings* and the *Philosophical Transactions of the Royal Society* in 1860 and 1861, and the second series in the *Proceedings* and the *Transactions* in 1887, 1889 and 1890. Others of the greatest importance are on the Agricultural, Botanical, and Chemical Results of Experiments on the Mixed Herbage of Permanent Meadow in the *Philosophical Transactions* for 1880 and 1882. Among the papers relating to Animal Chemistry those on the Composition of some of the Animals fed and slaughtered as Human Food, in the *Philosophical Transactions* of 1858, 1859, and 1883 will remain as monuments of careful experimental research.

Among the honours and degrees falling on Gilbert were the following:—He became a Fellow of the Chemical Society in 1841, was President in 1882-83, and at his death was the oldest surviving Fellow. He was elected Fellow of the Royal Society in 1860, and served on its Council; in 1867 he received, in conjunction with Lawes, a Royal Medal. He was a Fellow of the Linnean Society from 1875. He was President of the Chemical Section of the British Association in

1880, at Swansea, when his presidential address was on the Applications of Chemistry to Agriculture, and largely historical in character.

In 1893 the Society of Arts awarded an Albert Medal to Sir John B. Lawes and the like to Dr. J. H. Gilbert "for their joint services to scientific agriculture, and notably for the researches which, throughout a period of fifty years, have been carried on by them at the Experimental Farm, Rothamsted." The medals were presented on February 23rd, 1894, by H.R.H. the Prince of Wales. In 1893 Dr. Gilbert was Knighted.

From 1884 to 1890 Dr. Gilbert was Sibthorpian Professor of Rural Economy at Oxford.

In 1894 he received the honorary degree of D.Sc. from the University of Cambridge.

Besides these he held degrees of membership of many foreign academies and societies.

Dr. Gilbert was elected an Honorary Professor of our College in 1885, and in that capacity gave annual lectures for six years on some of the results of the Rothamsted experiments. These lectures were given from 1885 to 1891, and were on the *Rothamsted Experiments on Wheat, on Barley, on Root Crops, on Potatoes, on Leguminous Crops*, and *on the Question of the Fixation of Free Nitrogen.* They have been published in the *Gazette.** With the exception of the lecture on the Wheat Experiments, which had been published in the United States, all the others contain much original matter and tables which had not before been published, and we are justly proud that our *Agricultural Students' Gazette* should have had the privilege and honour of first publishing them.

Many of our readers will have a keen remembrance of the delivery of these lectures and of the mass of information they contained, and still more of the zeal and eagerness of the lecturer. The lectures were somewhat difficult to follow at the time of delivery owing to the great bulk of matter and number of figures crushed into each, but in their printed form they form storehouses of useful information.

The last appearance of Sir J. H. Gilbert at our College was on the occasion of the College Jubilee in 1897.

On the occasions of the annual excursions of College Students and Staff to Rothamsted, which continued for many years, they were met and conducted over the experimental ground either by Lawes or by Gilbert, and sometimes by both. These excursions will ever be remembered with a sense of keen pleasure and great profit by all those taking part in them; the expositions of the experiments, sometimes by Lawes and sometimes by Gilbert, in different styles, but with equal enthusiasm, were lessons of the greatest value. The invariable kindness and hospitality of Sir J. B. Lawes and of Sir J. H. Gilbert to R. A. College men will also long dwell in their memories.

---

*Vol. II., pt. 4, 1885. Vol. III., pt. 1, 1886; pt. 5, 1887. Vol. IV., pt. 2, 1888; pt. 5, 1889; pt. 6, 1890. Vol. V., pt. 2, 1890; pt. 3, 1891.

We are indebted to the following Old Students and Friends for financial aid which enabled us to publish the accompanying Photogravure Portrait of Sir J. H. Gilbert:—

C. Bathurst, jun.
H. Blaauw
A. G. Bloxam
Professor A. H. Church
T. A. Dickson
E. Druce
J. H. Dugdale
C. C. Duncan
C. Elwell
A. W. Finch
Dr. Wm. Fream
F. A. Garden
Professor T. Groom
P. H. Le Grice
W. T. Hall
E. B. Haygarth
J. Hendrick
J. Milne Home
J. A. Ross Hume
A. Hutchings
Lord Charles Kennedy
J. W. Kenyon
E. Powell King
Sir Nigel Kingscote
James Mason
P. T. Maw
Professor W. McCracken
A. Nettlefold
G. H. Nevile
E. C. Ozanne
H. Patten
C. Rawson
H. H. Robinson
M. P. Salvago
V. Stenhouse
J. E. H. Stooke
L. Sutton
J. G. Turnbull
S. Vlasto
Dr. J. A. Voelcker
T. B. Wacher
E. Walford
A. Weigall
J. M. Wood.

FARM FENCES.

The subject of fences is an old one, and there is, perhaps, nothing new to be said on the matter. But it has long ago been recorded, and the statement is being constantly verified, that "there is nothing new under the sun." The writer, therefore, offers no apology for selecting such an antiquated topic. But the subject demands on its merits attention in any serious study of rural economy, the importance of which science to our still greatest industry is wisely emphasized at the R.A.C.

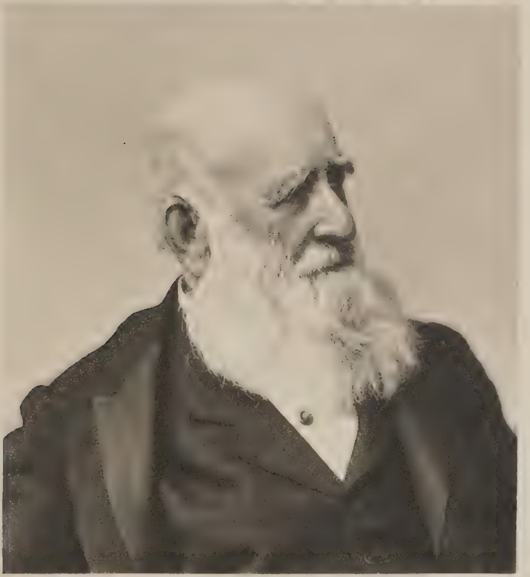
It will be advisable at the outset to define what is a "fence"? Literally, then, "fence" is a shortened form of the word *defence*. Now, while there are many kinds of defences, interesting severally to athletes, sailors, soldiers, engineers, antiquaries, and others, it is only proposed to consider some of those sundry barriers, high or low, broad, deep, crooked or straight, strong or weak, which, though of special interest to agriculturists, yet concern the nation at large. It may be asked In what way and to what extent? The answer is:—

Firstly, Fences are landmarks.
Secondly, They occupy space.
Thirdly, They are costly.
Fourthly, They are capable of improvement.

I. FENCES AS LANDMARKS.

So long have landmarks been used to define boundaries that one of the Mosaic laws enacted "Thou shalt not remove thy neighbour's landmark which they of old time have set in thine inheritance." (Deut. xix. 14.)

Perhaps in this country one of the earliest and simplest means of separation consisted merely of a narrow trench or ditch cut at the boundary, the outside edge of the ditch being the extreme limit of the



J. Henry Gilbert

[illegible]

Honorary Professor of the Royal Agricultural College, Cirencester

LIBRARY
OF THE
UNIVERSITY of ILLINOIS

owner's land. Periodically these ditches required cleansing. Eventually a bank became formed on the owner's land out of the material thrown up. After a time the bank became the nominal, though not the actual, boundary. But a ditch or bank of this sort was useless to protect the enclosed land from depredations or trespass of wild or domestic animals. Moreover, the owner required to prevent his own stock from straying. Thus it happened that with these objects in view a barrier or "fence" of some kind was made by the owner on his own land. If a wall were built its foundations would be laid in the ditch, in which case the outside of the structure would form the extreme edge of the boundary line. But if a "quick" (*i.e.* live) fence were proposed, while the outer edge of the ditch would still form the actual boundary, as well for the purpose of economising space as for a landmark (seeing that the bank had become the nominal and visible boundary), the hedge would be planted on the bank. The distance from the outside of the ditch at which the hedge might be made would be entirely at the owner's discretion; but in order that allowance might be made for the subsequent growth of the "quick," from three to six feet would be usual. For if a greater distance were allowed the owner would be "losing ground;" while if planted nearer the boundary there would be no space for erecting a temporary fence during the helpless "minority" of the hedge plants. Hence it is customary in cases where the ditch has become obliterated to reckon a distance of four feet from the "growers" as belonging to the owner of the fence. But in point of law, ownership of land outside a fence can only be claimed by proof that the ditch has been periodically scoured by the owner of the fence. There is nearly always a discrepancy between the area of individual fields, as measured by surveyors at the instance of the owner and by Government surveyors. In the former case, surveyors were careful to note in which field the whole fence and ditch were to be included; while on Ordnance maps measurements are taken up to the centre of each fence, regardless of the question of ownership. On whole estates, however, the totals of each survey practically coincide.

II. SUPERFICIAL AREA OF FENCES.

From what has been said, it follows that fences are coincident with boundaries. This fact it is which makes the epithet *crooked* applicable to many of them. Such fences—or at any rate such boundary lines—are old; *ergo* often weak, and by reason of repair, generally broad and high. Now a crooked, broad, and high bank and hedge occupy and injuriously shade much valuable land, without conferring a corresponding benefit on the owner or his neighbour. Such a fence is far from ideal. But so also is one too nearly approaching Euclid's idea of a line—"length without breadth"—because substantiality is a *sine quâ non* in a fence. But given strength, narrowness should be aimed at, so that the soil may be profitably used. Wide fences, too, shelter and breed vermin and weeds.

In order to form an estimate of the land occupied by fences, the writer has calculated on a farm in Shropshire, consisting of 233 acres, that there are 6⅕ miles of fencing of various descriptions, forming 24 enclosures, ranging from ¼ acre (garden) to 38½ acres. [Only fences, however, belonging to the farm are included.] Assuming an average width of 10 links (6 ft. 7 in.), this distance of 6⅕ miles (495¼ chains) amounts to 4 acres 3 roods and 32 perches, or equivalent to 2⅛ acres per cent. occupied by fences. It will be evident that the assumed width of the fences depends on the proportion between wide quick-set hedges and ditches and narrow iron or wood fences. It is probably underestimated at 10 links wide, because the base of a bank upon which a quick fence grows is wider than one realises. However, as the limit of a person's land is measured 4 feet from the growers on one side, while 2 to 3 feet can be fairly reckoned as covered by the hedge thorns on the inside, 6 to 7 feet may be taken as the width of an ordinary hedge row. Now on the hypothesis that this proportion obtains throughout this country, it can be estimated by reference to the Agricultural Returns how much of the cultivated land of Great Britain is unproductively occupied by fences. Out of a total area of 56,785,433 acres of which Great Britain consists, only about 4-7ths, namely, 32,417,455 acres were returned in 1901 as "Cultivated Land." Taking 2⅛ per cent. as representing the area of fences, there are found to be as many as 688,871 acres. This land, it must be remembered, is included in all calculations of land values, and at an average price of, say, £20 per acre, is worth £13,777,420.

It may be remarked in passing that in 1891 the total area of land and water was given as 56,786,199 acres, and the total acreage under crops, grass, and bare fallow was returned at 32,918,514 acres.

Trees in Fences.

It may be argued that fences are not entirely unproductive, inasmuch as timber trees and fruit trees are grown in them. It is possible that the latter, if not allowed to get too large and too old, may be profitably planted and cultivated in hedge rows. But when it is considered for what length of time a tree, such as an oak or elm, requires to grow till it contains, say, 100 cubic feet of timber, worth about £5, it will be questionable whether, on arable land, the value of the tree will be nearly sufficient to cover the loss of crops year after year around the tree, without considering the cost of trimming, etc. Such a tree would be probably 100 years old at least. (The growth of trees is slower in hedge rows than in plantations.) For say 50 years of its life the land and crops around it would be seriously injured for a distance of perhaps 4 yards, or about 1 square perch, exclusive of the land on which the fence stands. Such damage may be estimated at 8d. to 1s. per annum. At compound interest at 5 per cent., 8d. per annum accumulates in 50 years to £6 19s., or more than the assumed value of the timber tree. In addition to this, the roots of most large trees are responsible for breaking plough shares or damaging farm implements. Of course, shallow growing roots ought to be grubbed up where likely to cause mischief, but this again is a source of expense. The roots of wych elm are the worst offenders, as they run for several yards at only a few inches below the surface, and they are very tenacious.

III. Cost of Fences.

Before attempting to estimate the cost of the fences of Great Britain it may be advisable to consider briefly the method of forming, and approximate cost of, two classes of fences which fulfil at once the duties of barriers and shelters for live stock and crops, viz. :—walls and hedges.

Walls built of stone or brick are excellent fences. Their advantages may be summed up as follows :—

(i.) They form at once a barrier against animals and shelter for live stock and crops.
(ii.) They occupy little space.
(iii.) They can be built equally strong in any given direction, and on uneven ground.
(iv.) They harbour neither weeds nor vermin, and are vermin proof.
(v.) South aspects can be used for training the best class of fruit trees or flowering plants.
(vi.) Sheds can readily be constructed against portions of them, or sheep folds and yards can be made where two walls meet.

Where flat stones are plentiful, as on the Cotswold Hills or in the Lake District, walls are built without mortar at little cost—they are also cheaply repaired—as they can be constructed without the employment of a highly paid artisan. Walls made of brick should be built 9 inches thick and at least 6 feet high, so that horses or cattle cannot reach over them, else they are apt to push them down with their necks. A solid foundation must be obtained. They should be strengthened with piers or pillars every 3 or 4 yards. Such a wall would probably cost 14s. or 15s. per lineal yard.

"Quick" hedges are the best known form of fence. Hawthorn is the shrub usually selected. At three years old plants cost about 2s. per 100. They are planted in a single row at a distance of 5 or 6 inches apart, or if in a double row 8 or 9 inches apart. Holly, alone or with thorn, makes an excellent fence on light land. It is of slow growth, however; the bushes cost about 25s. per 100 when fit to leave the nursery. Myrobella and blackthorn are also useful fence plants.

The chief expense of making quick fences consists not so much in the cost of the quick as in the necessity for strong protection on either side. Also it is nearly always necessary to enclose the young plants with rabbit-proof wire netting—3 feet high $1\frac{1}{2}$ inch mesh. This costs about 10s. per 50-yard roll. The wire should be laid in a trench about 4 inches deep, the lower edge being turned outwards. The temporary fences may be made of posts and rails, for which purpose oak, Spanish chestnut, or larch are the best kinds of wood. Or strained wire may be used, supported by wood or iron standards. The initial cost of iron wire fences, according to the strength adopted, runs from 1s. 6d. to 2s. 6d. per yard. A thorn fence is usually allowed to grow for 10 or 15 years, when it is pleached. By the time it can take care of itself the temporary wooden fences are worn out; while iron fences can be removed and reformed. The rate at which quick grows depends upon the quality of the soil, and upon the amount of attention bestowed upon it in keeping it clear of grass and weeds. Obviously it pays best to hasten the time when it shall be self protecting and able to fulfil the object for which it was planted. It is most necessary for economical reasons that the fence be well cared for in its early stages and replanted where requisite, so that it may have no gaps, as these are difficult to fill up at a later period. It should be remembered that just as the strength of a chain depends upon the strength of its weakest link, so the strength of a fence depends upon the strength of its weakest place. To be serviceable it must be continuously good. A hedge properly planted and protected cannot be made under 3s. a yard. And as it requires some 15 years before it is useful, the original outlay at compound interest at 5 per cent. will have practically doubled itself. Of course it may be urged that it has formed a fence from the moment of its completion; but this could have been effected by the erection of only one of the temporary fences.

Referring again to the assumed ratio of $2\frac{2}{3}$ miles of fencing per 100 acres, the total length of fences on the cultivated land of Great Britain works out at 864,456 miles.

Taking the original cost at only £220 per mile, and £5 per mile extra for gates, the product, viz., £194,504,625, represents the total cost of making fences. To this add the estimated value of the land, £13,777,400, making a capital sum of £208,285,025 locked up in fences.

The annual expenses of owners and occupiers in renewing and repairing gates, walls, etc., in gapping, pleaching, and clipping the hedges, in scouring the ditches, etc., may be fairly put at £2 per mile, or £1,728,930. If to this be added £7,780,185, that is interest of money at 4 per cent. on the original outlay, the sum chargeable to fences is £9,509,115.

[To students desirous of pursuing the subject of statistical problems relating to land, the writer of this paper recommends a perusal of Mr. Albert Pell's article on "The Making of the Land in England," in the *Journal of the R.A.S.E.*, No. 46 (1887); and Mr. R. E. Turnbull's exhaustive enquiry into "Farm Capital and Revenue," which was published in the *Transactions of H. & A. S., Scotland*, 1898.]

IV. SUGGESTIONS.

Now it may be expected that the writer has some drastic remedies to suggest. This, however, is not the case. The writer does not advocate the grubbing up of fences indiscriminately; but, on the contrary, recommends greater care to be bestowed on fences where fairly good. He would point out a few of the ills from which fences suffer.

Hedges are often spoiled by permitting stakes of elder, ash, willow, etc., to take root and grow. Such trees are too smooth for fence purposes, and by their more rapid growth choke the thorns. If the points of stakes are charred in a fire there is no fear of growth, and this process makes them last longer. Brambles, honeysuckle, ivy, nettles, bryony, and hops are sources of much mischief to quick fences : they smother the branches and rob the roots. Their action is insidious, because their very luxuriance hides the damage they are doing. Rabbits cause great damage by burrowing and by eating young shoots and the bark of the healthiest branches at the bottom of the fence. Sheep, especially lambs, cause damage by nibbling.

The writer warns landowners not to make new fences rashly. A little consideration and forethought will often save length, expense, and space. If a certain area is required, say for planting trees in an open space, the circle is the most economical figure. For example, 1 circular acre can be enclosed by a line measuring less than 247 yards; while if a square figure be adopted, the total length of the enclosing lines would exceed 278 yards. Any departure from the square is attended by loss of area in proportion to the sides, except when the figure more nearly approaches a circular shape. An enclosure of 1 acre having 6 equal sides can be formed with about 259 yards of fencing. If required, similar hexagonal enclosures can be attached to any of the sides, or the whole surrounded without loss of space. Since areas of squares are proportional to the square of one side, and in the case of circles to the squares of their diameters or circumferences, it will be obvious that large spaces can be more economically enclosed than small ones. Thus a square ten-acre field is bounded by lines measuring together only 880 yards.

In conclusion, the writer hopes his readers, instead of being bored (which he fears), will be rather stimulated to think out for themselves the many economic problems connected with Land.

E. S. DAVIES, M.R.A.C.

A PHILOSOPHER OF THE COTTESWOLDS.

It is possible that to the unobservant his great qualities were hidden : all that they saw in him was a tall, shabby-looking old man who walked with that indescribable garden-roller sort of motion usually associated with the gait of those who minister to us in the coffee rooms of hotels : an old man, who, professedly a jobbing gardener, looked like a broken-down something else. Frequently they did not even take the trouble to crystallise their doubt into a question, a sure and certain measure towards its solution.

But there were those who saw beneath the surface, who were moreover privileged to have speech of him—and he was always very ready to converse, leaning on his spade the while, but with the air of one who only just tolerated such interruption—these would find that here was one whose ideas were the result of reflection and observation, not mere echoes of the local press, or, as is sometimes the case in other and higher walks of life, those of the reviews or quarterlies.

To tell the truth my philosopher could read but indifferently well, and when he indulged in such exercises, as "of a Sunday," liked the print to be large and black: as the halfpenny papers in no way pander to such luxurious tastes in their readers, he was fain to take his news second hand, by word of mouth, thereby materially increasing even its romance and variety.

One day *apropos* of some flowers he was to take to the church for Easter decorations, I asked him whether he was a Churchman himself. "No," he said slowly, stopping short and watching me somewhat anxiously to see the effect of this pronouncement, "I goes to chapel, they 'ollers more, and 'tis more loively loike—I bin to church, I 'ave, don't you think as 'ow I 'aven't sampled 'em both careful—but Oi be gettin' a holdish man, an' them curicks is that weakly an' finnicken in their ways, it don't seem to do me no sort o' good nohow. Not as I've nothin' to say agen 'em, pore young gen'lemen, they means well, but they be that afráid of the sound of their own voices, and they looks that thin and mournful—I can't away with 'em." Here he shook his head sadly, as though overcome with melancholy at the mere recollection.

"You are quite right to go where you feel you will get most good," I said meekly; "is Mr. Blank a very powerful preacher?"

He smiled a slow crafty smile, shutting one eye with something the expression of a gourmand who holds a glass of good port between himself and the light. "Well I don't know as I should go so fur as to say as 'e's powervul, but 'e do 'oller an' thump the cushion as do do yer 'art good to see, an' 'e do tell us plainish where them'll go as baint ther to yer 'im, but I baint sure as 'e's powervul. The powervullest preacher I ever 'ear was Fairford way at a hopen air meetin'—an' 'e was took up next day for stealin' bacon!" Here he returned to his digging with the air of one who had said the last word and could brook no further interruptions.

Regarding politics he was even more guarded in his statements: I could never discover to which side he belonged, even at a time when party feeling ran particularly high, as our town had been in the throes of two Parliamentary elections within the year. He seemed to regard the whole of the proceedings with a tolerant sort of amusement—tolerance was ever a feature of his mental attitude towards life generally, but as to stepping down into the arena and taking sides! Such a course was far from one of his philosophical and analytic temperament. He listened to both sides with a gracious impartiality that I have no doubt sent each canvasser away equally certain that his was the side would receive the listener's "vote and interest."

"The yallers they comes," he would say, wagging his large head to and fro, and smiling his slow broad smile, "an' they says, 'if our candidate do get in, you'll see what us 'll do for 'ee. 'E'll do sech and sech, an' you'll 'ave this 'ere an' that,' but the blues they went and sent my missus a good blanket *on the chanst.*"

"And for whom did you vote after all?" I asked with considerable curiosity.

"Well, I baint so to speak exactly sure," he said, scratching his head, "I baint much of a schollard, so I ups an' puts two crasses, one for each on 'em, an' I goes an' marches along of two percessions that same day, so *I* done my duty."

But his universal tolerance stopped short of his legitimate profession. In matters horticultural he was a veritable despot, sternly discouraging private enterprise of any sort. Above all did he object to what he was pleased to call "new fanglements" in the way of plants, and in the autumn had a perfect passion for grubbing up one's most cherished possessions and trundling them off in the wheelbarrow to the rubbish heap. One autumn a friend presented me with some rare iris bulbs, which, knowing the philosopher's objection to "fancy bulbs" I secreted in a distant greenhouse which he as a rule scornfully ignored. On a day when someone else was benefiting by his ministrations I hastened to fetch them, intent on planting them "unbeknownst," as he would have said.

Not a trace of them remained, and I had to wait until his next visit, when I timidly asked if he happened to have moved them. "Lor' bless my 'eart! was them things bulbses? I though as 'ow they was hold onions and I eat 'em along of a bit of bread for my lunch. I remember thinkin' as they didn't semm very tasty loike!"

On the subject of the war there was no uncertain sound about his views, and had he been a younger man his waiter-like walk would doubtless have changed to the martial strut induced among the rural population by perpetual practice of the goose-step. As it was, he thirsted for news with the utmost eagerness, and hurried up one Sunday morning to inform us that Lord Roberts had taken "Blue Fountain" about two days after that officer had arrived in South Africa.

A short time ago it was rumoured that a gentleman of pro-Boer proclivities proposed to address like-minded citizens in the "Corn Hall." I fear he must have had but a small following if, as I believe, the majority of the natives were of like mind with my usually philosophic gardener. "I'd warm 'im," he exclaimed, digging his spade into the ground as though the offending propagandist were underneath, "I'd warm 'im. I'd knock 'is ugly 'ead off before 'e'd come 'is nasty Boerses over me. Let 'im go to St. 'Elena and *mind* 'em, then 'e'd know. 'Taint no use for 'im to come and gibber to the loikes of us as 'ave 'eard their goin's-on from them as 'ave fought agen 'em, and minded 'em day by day and hour by hour, till they was that sick and weary! . . . . Boers! I'd Boers 'im," and with grunts and snorts expressive of intense indignation the philosopher rested on his spade glaring at me as though I were a champion of the King's enemies—which heaven forbid.

"It's like this 'ere," he said, after a moment's pause, "there's toimes w'en the meek-'eartidest aint safe if you worrits 'em, and these 'ere be them sart of toimes."

O. S.

NOTES ON FRUIT CULTURE.

The cultivation of fruit is largely on the increase in Great Britain. In 1892 the acreage under orchards was 208,950 acres, in 1901 the Agricultural Returns gave 236,203 acres, or an average annual increase for the ten years of 2,725 acres. This extended area is no doubt in a large part due to the general depression in agriculture, which has caused people to seek a more profitable outlet for their energy and capital than is to be obtained by the raising of corn and the rearing of live stock. Another reason may be found in the largely increased consumption of all kinds of fruit, both home grown and imported, by all classes of the community. We may take the Apple as an instance of this enormously increased consumption. We import annually thousands of tons of this fruit from America, and yet our climate and soil is more adapted for the production of this fruit than any other country in the world.

Small fruits, such as the Strawberry, Currant, Gooseberry, and Raspberry, may all be grown to perfection and without fear of competition, it not being possible for the foreign producer, owing to distance, to place such fruits on our market in the finest condition.

The points a person starting to grow fruit will have to consider are (1) Markets for which he proposes to cater; (2) For what kind of fruit his soil is particularly adapted. Should the land which it is decided to plant be in close proximity to some large town it will probably be found most profitable to plant a mixed plantation of hard and soft fruits, and utilise the intervening spaces for the cultivation of flowers, vegetables, &c. Should it be decided to specialize one particular fruit, such as the Strawberry or Apple, it will be advisable to select a soil specially adapted for the cultivation of such fruit, taking into consideration what markets will be available. If hard fruits, such as the Apple or Pear, are to be planted, distance from market is a secondary consideration to adaptability of soil.

These important points having been satisfactorily settled, the preparation of the soil will need the planter's attention. It is of the greatest importance before planting that the ground should be thoroughly cleaned; if this is not attended to in the first instance it will be the cause of much trouble, expense, and worry in the near future. The land should also be in a high state of fertility; a better start will thus be given to the trees or plants, and a quicker return insured.

Dealing with the most important kind of fruits, the following may be taken as a summary of the best methods of planting, cultivation, and returns.

The Strawberry may be grown in any well cultivated soil, provided it is not a tenacious clay or light sand. The best time to plant is in the month of August or March, care being taken to select strong and well-rooted plants; these should be set a distance of 2 ft. 6 in. between the rows and 2 ft. in the rows. This will allow the use of horse labour for keeping the ground free from weeds. An average crop will give 1 to 1½ tons gross return of £30 to £40 per acre. A profitable return will be obtained at the end of about the second year, and the plantation may be kept down from five to seven years.

The Raspberry is best grown on a sandy loam, and in suitable soil is one of the most profitable crops to raise. They should be planted in rows 4 ft. apart with 1 ft. to 18 in. between the plants, and yield a crop of 1½ to 2 tons per acre, and give a gross return of £35 to £45. At pruning time about six canes should be left, cut back different lengths from 2 to 4 ft.

Red and White Currants are best grown on medium and light soils, 5 to 6 ft. apart being a suitable distance at which to plant. The return from these is of an uncertain nature, the demand being limited compared with other small fruits. About 2 tons may be considered a good crop per acre, which may be sold at from £10 to £12 per ton. They may be pruned any time during the winter, being trained in a vase shape, 5 or 6 branches being kept spurred hard in.

The Black Currant requires a rich soil with a cool subsoil, and would be one of the most profitable of small fruits were it not that when grown in large areas the bushes are too frequently rendered useless by the attacks of *Phytoptus ribes.* This gall mite prevents many people from entering on the cultivation of this fruit, no cure having as yet been found for the disease. They should be planted 6 ft. apart, and grown from stools not on a leg, as they bear on the young wood, some of the old wood being pruned out every year and suckers allowed to take its place. 1½ to 2 tons may be expected per acre, and can be readily sold at £18 to £20 per ton.

The Gooseberry may be grown in any good soil provided the subsoil be of a dry nature; 6 ft. apart is the most suitable distance at which to plant. Bushes should be pruned as little as possible, merely keeping them sufficiently clean to enable the pickers to gather the berries with ease. An average yield will be about 3 tons per acre, which may be sold at a gross price of £5 to £8 per ton, but the price of this berry is liable to considerable fluctuations.

The above comprise the chief of the small fruits grown for profit in this country. They may frequently be planted with advantage between standards, half-standards, or bush trees of the Apple, Pear, Plum, and Cherry, these latter eventually forming the permanent crop.

The Apple is generally grown as a standard on grass, or for commercial purposes and quick returns as a bush, with the intervening spaces kept free from weeds, and underplanted with other crops. When planting standards on grass they should be set from 25 to 35 ft. apart. According to the variety, at the end of 25 to 30 years an average crop will be about 5 tons per acre, but this will largely depend on the variety. When planted as bush trees they may be set 8 to 15 ft. apart, according to the variety and soil, and whether grafted on the Paradise or Free Stock. At the end of the tenth year they should give a yield from 8 to 10 tons. Apples of good quality may be relied upon to give a gross return from £6 to £10 per ton.

The Pear requires a lighter soil than the Apple, with a dry subsoil. Our climate is not as suitable for their production as for the Apple. The above remarks on the distances to plant the apple apply equally well to that of the pear. The quantity per acre and the gross returns vary greatly with the variety and season.

Plums may be grown in any good soil, the exact suitability of any particular soil largely depending on the variety. Damsons do best in a strong loam. Six tons per acre may be considered an average yield for standard trees, and may sell at anything from £3 to £10 per ton. They are also largely grown as half-standards and bushes.

Cherries must be grown in a gravelly soil; if planted in a heavy soil they are liable to gum. They are generally grown as standards planted about 30 ft. apart, and are as a rule a very remunerative crop.

With regard to pruning standard and bush trees when grown for profit, the less that is done the better. In the earlier stages of growth sufficient pruning must be done to train the tree into a well-balanced and comely shape. After that prune as little as possible, merely cutting out any cross boughs and keeping the centre of the tree open to admit the sun and facilitate the picking of the fruit.

From the above it might be concluded that the profits on fruit culture would be very large indeed, but it must be remembered that the initial outlay is very considerable. The full returns are only obtained after some years, and the general expenses of cultivation amount annually to a large sum.

In an article of this length it is impossible to enter into the question of expenditure, but without doubt a highly remunerative return can be obtained by the cultivation of fruit by anyone desirous of following agricultural pursuits.

George Marshall.

THE RECEPTION BY FLOWERS OF UNBIDDEN GUESTS.

The main object of the bright colouring of flowers, the presence of floral nectaries, and the multitudinous arrangements for the attraction of animals, is to ensure a speedy transference of pollen from flower to flower and so bring about cross-pollination. Certain visitors to flowers are provided with abundant food, principally in the form of honey, and many are the arrangements which exist to enable these visitors to obtain the food they desire with expediency and comfort. Most important of all, these animals are of advantage to the plant, and are known as the "bidden guests." The most ideal agents for cross-pollination are winged insects and humming-birds, which dart about from flower to flower, often visiting several flowers per minute, and in consequence these are the most welcomed of all guests. There are, however, a large number of creeping and flying animals which are by no means desirable visitants. Such are snails, centipedes, caterpillars, beetles, and many insects which on account of their size and form are unable to bring about a rapid transference of pollen; and all such animals which interfere with or prevent the speedy transfer of pollen from flower to flower must be regarded as *unbidden guests.*

The defence maintained by the plant for the exclusion of undesirable and harmful visitors is one of the great factors in the efficiency of the arrangements for the reception of the bidden guests, and the consequent cross-pollination. The entrances to flowers are guarded by all manner of fortifications of which certain animals only possess the pass-word. Walls and trenches, cushions and folds, brush-like masses of bristles and dense clusters of hairs, whilst still allowing access to the land of milk and honey beyond, effectually guard the entrance, and prevent the direct admission of any but the most powerful animals. Small, weak insects find it difficult to traverse such a straight and thorny path, but have to circumvent these obstacles, which, in many cases, have been specially arranged and placed in the way of these little pedestrians in order to bring about the desired result. These persevering animals are unconsciously compelled to brush past the anthers and stigmas of the flower in order to overcome the obstructions in their journey. In this way they become welcome guests, and if they complete their journey successfully are handsomely rewarded at the end. Many of the small, wingless insects are, however, harmful visitors on account of the time occupied in their transit from flower to flower and the little likelihood of the safe transport of the load of pollen they carry with them.

Plants possess a variety of arrangements for protection against wingless trespassers which creep up from the ground. Sometimes honey equal in quality to that secreted by the floral nectaries is secreted by the stem and leaves, as in many of the Balsams. Honey-loving ants and other wingless insects, in their tedious journey up the stem of such a plant to get at the flowers, are tempted by the wayside, and are quite satisfied with the abundant repast set before them. In this way the honey of floral nectaries is protected for the use of the more beneficial visitors or "bidden guests." A number of plants, mostly of tropical origin, and known as *myrmecophilous plants*, keep a garrison of small bloodthirsty ants for protection against honey-seeking pedestrians. This army of mercenaries is given a lodging in special cavities developed by the plant, and is provided with food in the form of sugary and albuminous substances. In return for the barrack accommodation and rations supplied to this "standing army" the plant is kept free from the invasion of larger honey-seeking ants and leaf-eating animals.

Arrangements of every conceivable kind, some simple and others extremely complex, are met with in nature to protect the honey and pollen of flowers from the ravages of snails, caterpillars, centipedes, earwigs, ants, &c. These various arrangements comprise isolation by water, defence by means of rings of prickles and spikes, and prevention of access by means of complete rings of sticky substances. All these are for the reception of the unbidden foot-passenger!

Isolation by water is seen in the case of numerous aquatic and marsh-loving plants. The flowers of the Water-lilies, the Arrow-head, the Water-soldier, the Bladderwort, and many others, are well protected from the visits of land animals by a broad belt of water. Only insects such as flies and beetles can obtain access to the honey and pollen of flowers so protected. Sometimes, as in the Teasel, various contrivances in the form of small saucers, basins, and dishes exist as appendages to the leaves and leaf-bases. These collect and retain rain-water, in which numerous insects are drowned on their way up to the flowers. The water becomes muddy with decomposed animal matter and is gradually absorbed by the tissues of the leaf. Thus these contrivances not only serve to protect the plant from insect marauders, but act, as do the special organs of insectivorous plants, as accessory structures for obtaining a further supply of mineral and organic compounds.

Sticky secretions are more often used than water as a protection for flowers. The substances secreted are various kinds of gums, resins, &c., and are of the consistency of bird-lime. They occur most frequently on the flower-stalks, but are sometimes found on the involucre of bracts enclosing flower-heads. In all cases the main object in view is to place difficulties and dangers in the way of pilfering insects. Large numbers of flowers accomplish the same purpose by means of glands and glandular hairs, which are situated on the flower-stalk or on the floral whorls themselves. Tiny insects in their attempts to reach the flowers stick to these hairs, and the more they struggle the more embarassed they become. Some plants exist in which the entire shoot is sticky, leaves and flowers all being of a stickiness which is truly remarkable. Examples of this are seen in certain Primulas and Saxifrages. Other plants exhibit a waxy coating on the flower-stalks, thus barring the approach of ants and other hard chitinous insects, which lose their footing and fall to the ground. The presence of sticky secretions does not render a plant immune from the depredations of snails and slugs, which can overcome obstructions by secreting a copious slime themselves.

Protection by means of *prickles, spikes, stiff hairs*, &c., is chiefly directed against the attacks of soft-bodied animals such as snails, slugs, and caterpillars. The defensive structures may be scattered over the whole of the foliage or they may be confined to the floral regions of the plant. Those clusters of stiff bristles and hairs found inside the cavity of the flower are for protection against undesirable winged insects, whereas those outside the flower are to prevent the access of animals which creep up from the ground. In flowers which possess tubular corollas the interior of the corolla-tube is often lined with stiff hairs which project into the cavity and effectually prevent the pilfering of the honey at the base by undesirable insects.

The heads of small flowers in many of the Composites and Scabiouses are very rich in honey which is only accessible to insects which visit them from above, in the region of the stamens and stigmas. They are protected from side attacks by an involucre of closely-fitting, tough, imbricate bracts, which are sufficiently strong to resist the biting mandibles of beetles.

Some flowers have a periodic display of attractions for insects with the object of keeping away unbidden guests. Such flowers occur in the Caryophyllaceæ and Scrophulariaceæ. They appear dark and inconspicuous to day-flying insects, but at night the corolla unfolds, standing out brightly, and at the same time they frequently give off an attractive scent. They thus exhibit their charms to night-flying moths and are cross-pollinated mainly by such insects.

G. S. West.

AT THE FRONT.

Captain C. R. H. Gresson, who has been attached to Roberts's Horse throughout the war in South Africa, and has seen a great deal of fighting, has now joined the 1st Regiment of the Imperial Light Horse, and is at or near Harrismith.

R. W. Oldnall (R.A.C. 1894-1895), Captain 3rd R.M.F., is serving with the Field Force in the Orange River State.

M. G. Godlonton, M.R.A.C. (1900), has been called out as member of a Farmers' Corps, and was recently assisting in holding Bennett's Kop, Winterberg.

Captain A. G. Weigall, M.R.A.C. (1894), of the 3rd Batt. Northamptonshire Regiment, has left for South Africa with his regiment. He had been elected to the Presidency of the R.A.C. Club for the present year.

EQUIPMENT OF A NORFOLK FARM.

Having been asked to write some article for the College *Gazette*, it struck me that a short account of the capital required and the way it has to be laid out on the average Norfolk light land arable farm near Norwich might be instructive. The farm I have in my mind is about 380 acres, of which 22 are meadow, and we took it in hand Michaelmas, 1895. The land was in good condition, but the wheat stubbles were very foul. The buildings are excellent, with 16 good bullock boxes and plenty of yards, horse boxes, barns, and stables.

The first thing to think about is getting on the farm with a few horses as soon as possible after harvest; to do this it is necessary to get the consent of the out-going tenant, as it is most important in this county to get the ploughs into the wheat stubbles and do some autumn cultivation, as we find, if we get the stubbles and couch on the dtop an well cleared of mould and leave it on the top till after the wheat sowing is done and then plough it in, that, in the spring, the land will come up nearly clean and work exceedingly well and make us pretty sure of a root crop here. I may point out the land is farmed on the Norfolk four-course system, namely, wheat, roots, barley, one year hay, and then on again with wheat.

The question of horses and implements next crops up. The farms in these parts are mostly large and there are sure to be each Michaelmas several large auctions in the neighbourhood, and it is most advisable to buy the implements second-hand at these auctions.

The quantity required on a farm like I am describing is enormous. This one requires 5 waggons, 7 tumbrels, 6 ploughs, corn drill, small seed drill, turnip drill, self-binder corn reaper, grass cutter, tedders, 2 topplers, horse rake, 2 horse hoes, 1 3-horse drag-harrow, pair 4-horse drag-harrows, 3 sets of 3-horse harrows, 2 sets of 2-horse harrows, chain harrow, seed harrow, a 1-horse roll and a 2-horse roll, 2 bullock turnip cutters, and 1 sheep turnip cutter, water cart, 16 bullock bins, 20 sheep bins for roots and 14 for hay, 3 ladders, harness for 18 horses, barn implements, and horse works for chaff cutting. I see the above, including many smaller items, were bought at auctions for £277 10s. 0d. At the same auctions horses, sheep, and pigs are sold, a few bullocks and a good many sheep.

It is very advisable to buy horses between about 9 and 13 years of age for the harder work and colts about 2 off or 3 off for the lighter work, avoiding those aged 5, 6, 7, as they make high prices for town work, and if you buy them, when you want to sell, as a landlord generally does, in a few years they will have depreciated enormously, whereas horses keep their prices fairly well between 10 and 14, and of course the colts grow into money. We find a 2 off can do half a day's work regularly and after the first six months with care a good deal more. Well, I see for this farm I bought 18 horses as the land was foul, and several were young. The 18, including 2 foals, cost £498; now we keep 14 in work. We bought 70 ewes to clean up behind the lambs on roots and 400 lambs to put on the roots, the 470 sheep costing £714 19s. 0d.

Bullocks come to Norwich market in October and November in great numbers; we bought 39 at £13 each, and 25 at £9 10s., making £744 10s.

In Norfolk the outgoing tenant is paid for what are called the "covenants." He is bound to leave on the farm and to be paid for the hay grown the last year, the straw, roots, muck left (about half of the year's make), and the small seeds (if sown by him and not by the incoming tenant). The straw he is not paid for in money, but the incoming tenant has to thrash and cart out the corn free of charge. The amount payable for the covenants varies a good deal, in one season as much as 25 % more than in another, owing to good or bad crops; in this particular year, 1895, on this farm they amounted to £895.

The first year no money will come in before Christmas, when the fat sheep and bullocks will begin to go, and about £12 a week has to be found for labour till then. The horse food, cake, &c., will also have to be bought, and it is very advisable to pay for this monthly.

Therefore to sum up we find that an arable farm near Norwich of about 22 acres meadow and 360 arable in the autumn of the year 1895 required command of the following amount of capital, viz. :—

	£	s.	d.
For Implements	277	10	0
„ Horses	498	0	0
„ Sheep	714	0	0
„ Bullocks...	744	10	0
„ Covenants	895	0	0
13 Weeks' Labour	144	0	0
Seed, Corn, Cake, Sundries, and Horse Food	250	0	0
	£3,523	0	0

Between Christmas and the 1st of June all the bullocks and sheep, except a few ewes, would be sold, and probably on that date the capital in the farm would be reduced to under two thousand pounds.

MICHAEL FALCON, M.R.A.C.

WHITE SCOUR IN CALVES.

The cause of this extremely fatal disease has recently been investigated by Profs. Nocard, of Paris, and Mettam, of Dublin, at the request of the Department of Agriculture and Technical Instruction for Ireland. The inquiry has met with very great success, and the reports of the eminent veterinarians have just been published by the Department in pamphlet form under the heading of "Mortality among Calves in Munster." Some idea of the necessity for taking steps to combat the disease may be gathered from figures given by Prof. Mettam. During the preceding year at farms visited by him the mortality was as follows :—

Farm (a) 35 dead out of 40 born.
„ (b) 41 „ „ 46 „
„ (c) 60 „ „ 70 „
„ (d) 90 „ „ 100 „

and so on, and this at farms where more than the average amount of care and attention was paid to the calves and housing.

Until recently the general idea was that the disease was caused by organisms gaining access to the alimentary tract through the medium of food, or dirty udders or utensils. Nocard's experiments, however, dispel these ideas and prove that the umbelical or navel cord is the channel of infection. Moreover, the experiments detailed prove that the lung disease, which is fatal to so many calves that have recovered from white scour, is identical with that disease so far as the primary cause is concerned, the only differences being in the seat of the lesions and the period required for the development of symptoms. The mode of entrance of the causal organism, which Nocard recognises as a Pasteurella, having been proved, preventive measures immediately suggest themselves in the form of thorough disinfection of the umbelicus *immediately* after birth before infection can take place, and strict cleanliness to prevent subsequent infection. But Nocard also observes that in some cases the infection can occur at the moment of birth "during the passage of the fœtus through the vagina, the mucous membrane of which always contains a large number of microbes of various kinds" (p. 17 of report). Hence disinfection of the genital passages immediately before parturition must be included in the prophylaxis in infected districts.

Nocard's advice is well worth reproducing in detail. He says "The farmers may ward off the disease if they will conform exactly with the following rules :—

"1. Provide the cows that are about to calve with dry and clean bedding, and keep it in good condition until after the calf is born.

"2. When the cow shows signs of being about to calve, the vulva, the anus, and the perineum should be disinfected with a warm solution of lysol in rain water—20 grams of lysol to one litre of water (2 per cent. solution). The vagina should be washed by injecting, by means of a large syringe, a considerable quantity of the same warm solution of lysol.

"3. Whenever possible the calf should be received upon a piece of clean cloth, or at least upon a thick bed of fresh clean straw unsoiled by urine or excrement.

"4. The cord should be tied immediately after birth with a ligature of twine which has been kept in the lysol solution : the cord should then be cut below the ligature.

"5. The portion of the cord still attached, as well as the umbelicus, should be dressed with the following solution applied by means of a large brush :—

Rain water	1 litre (say $1\frac{3}{4}$ pints).
Iodine	2 grams (say 31 grains).
Iodide of potassium ...	4 grams (say 62 grains).

"6. The disinfecting of the umbelicus and the cord should be completed by dressing with another brush dipped in the following solution :—

Methylated spirit ...	1 litre (say $1\frac{3}{4}$ pints).
Iodine	2 grams (say 31 grains).

"7. The operation is finished after this spirit has evaporated, by painting upon the cord and umbelicus a thick layer of

> collodion and iodine (1 per cent.) applied with a third brush. When the collodion is dry the calf may be left to the care of its mother."

This process may at first appear complicated on account of several different materials being used, but the complication is necessary for the perfection of the system. After thoroughly disinfecting with the aqueous solution of Iodine the umbelicus may be rendered germ proof with a coating of collodion. But the latter will not adhere to a wet surface, hence the object of the spirituous solution of Iodine to dry the cord before the application of the collodion. The only alternative line of treatment that suggests itself to us is the local application of disinfectants maintained in position by a truss. The dressings would then require to be renewed every day until the umbelicus closed, so that on the whole the labour would be increased and the disinfection probably not so thorough.

Agriculturalists generally should feel very grateful to the Department for instituting the investigation; and to Professors Nocard and Mettam for the masterly manner in which they have probed this intricate question of calf mortality and found a solution to the difficulty.

The Prefatory Note (which appears to be anonymous) is rather unfortunate. The writer makes a considerable blunder in summing up the results of Nocard's researches. Par. 2 of his summary runs as follows:—"That this disease is caused by a specific microbe or 'Pasteurella,' which Professor Nocard identifies with the microbe which in the horse produces pseudo-farcinous ulcerative lymphangitis, &c." That statement, however, is not in accordance with Nocard's Final Reports (sec. B, viii., pp. 21-24). He does not say that the Pasteurella which is primarily responsible for white scour and lung disease is identical with the microbe of ulcerative lymphangitis; but he says that *a bacillus* (not the Pasteurella), which is found in the lesions of the lung disease, is identical. After describing this particular bacillus Nocard says (p. 22) "There is no doubt as to its nature. It is the same . . . . which I have demonstrated to be the cause of ulcerative lymphangitis in the horse, &c. . . . . Is this bacillus the real cause of lung disease? . . . . We have not, however, yet succeeded in reproducing lung disease by inoculating healthy calves with pure cultures of this microbe either by inhalation or by direct injection into the trachea, veins, or even pulmonary tissue." He then describes an experiment on which he bases his opinions, and concludes "The specific bacillus, always present in the dust held in suspension in the atmosphere of infected cow-houses, is powerless to invade the pulmonary tissues of *healthy* calves, but when the toxins of the Pasteurella have paralysed the defensive action of the phagocytes, the bacillus penetrates the tissues and there multiplies, &c." There we see distinct reference to duality and not identity of the organisms in question. The writer of the Prefatory Note also credits Professor Nocard with the isolation of the bacillus of contagious abortion amongst cattle. But "Honour to whom honour is due," that credit belongs to Professor Bang, of the Copenhagen Veterinary College.

The reports are written in a most lucid and masterly manner, and are well worth studying by anybody interested in breeding, or in methods of bacteriological research. G. H. Wooldridge.

R.A.C. ATHLETIC SPORTS.

The College Sports were held this year on Wednesday and Thursday, April 2nd and 3rd. The following officials had charge of the arrangements :—

President.—Rev. J. B. McClellan.
Stewards.—Prof. Kinch, Prof. Paton, Prof. Blundell,
and Messrs. J. R. Eddison, G. P. Harben, R. H. Keane, and F. Scully.
Hon. Secretaries.—Messrs. C. E. Ermen and G. A. Lambert.
Judges.—Prof. West, Prof. Wooldridge, and Mr. E. B. Haygarth.
Starter.—Mr. J. A. Ross-Hume. *Time Keeper.*—Prof. Locke.

The Sports Committee consisted of Messrs. Kinch, Harben, Keane, F. Scully, Eddison, Ermen, and Lambert. Mr. B. S. Cave kindly acted as Judge on the first day in place of Mr. Haygarth.

Wednesday was a good deal given up to running off the heats in the various events, though some of them were finally decided. The winners of the heats for the Hundred Yards were Harben, T. A. Scully, F. Scully, Brigstocke, and Ermen.

Thursday's programme was started at 11.30 with the Quarter Mile (open) ; and the Walking Race was also decided before lunch, the first place falling to Eddison ; T. A. Scully led the way for the first mile, and continued walking pluckily till the last lap, when he was passed by Thompson.

The serious business of the day began at 2.0 with Throwing the Hammer, which was won by F. Scully, Eddison being second. Scully seemed bothered by having to throw from a circle, as he is up to a much greater distance than that which won him first place.

The Tug-of-War between the Out-Students and In-Students aroused much enthusiasm among the supporters of both sides. The first pull was won by the Out-Students, after pulling with varying fortune for at least three minutes. After a short rest the two teams again faced each other, and this and the succeeding pull was won by the In-Students only after strenuous efforts on the part of their opponents to avert defeat. The winning team was composed of Keane (Captain), Gamble, Ermen, Ratcliff, Morrison, Harben, Calder, and Brigstocke.

The Mile, six starters, was won by Hartley, who also won the Three Miles, eleven starters, on the previous day in capital style, finishing with a quarter-mile pace. Hartley is, we believe, going to one of the Universities. We can only wish him every success, and hope to hear of him figuring at Queen's Club next year in the 'Varsity Sports.

The Half-Mile Handicap showed that Henniker is a runner, and he ought to have started for some of the other events ; Parker was a good fourth.

The great event of the day was the Costume Donkey Race, for which there were ten starters, besides a large number of "Improbables." The costumes were quite up to the usual standard of excellence, and did great credit to the inventive genius of the various competitors. Harben's "Agriculture" took first prize for costumes; this was a fearful and wonderful mixture of products from No. 11, and the year which produced them must, we imagine, be one of blessed memory to farmers. The centre-piece in this wonderful collection was a beer barrel labelled "College beer," and, evidently to reassure scoffers, we noticed on the other side "Pure barley, malt, and hops." As this costume must have required unparalleled courage to enter, the first prize, we think, was quite rightly awarded to it. Of the other costumes, Symons as a "Jappy" was much admired; Osmond Smith appeared in a wondrous creation of many colours as a "Ping-Pong Girl"; Scully as a "Schoolmaster" sent a shiver of remembrance down many a back; and Farwell as "Clown" might have arrived straight from Drury Lane! The race was won by Calder, costume "Turf Tout," his speed being more reliable than his "tips," which must have proved traps to many enthusiastic investors, but no doubt served as a useful blind to the superior staying powers of his own mount. Farwell carried off second prize, but might have been first if his donkey had not lost all interest in the proceedings just before reaching the winning post. The rest of the entries had evidently been overtrained as they were unable to get the course in time to be first. Donald Smith appeared as a well known "Mechanic"; Stavroupoulos in the disguise of "Old Nick"; Ermen in a very fine "Smoking Costume"; and Collins as an advocate of "Freedom."

This race closed the list of events, and shortly afterwards the prizes were given away by the Countess Bathurst, whose kindness in coming was appreciated by hearty cheers called for by Keane and taken up by the company present, followed by an expression of thanks from the Principal on behalf of the College. The Sports were patronized by a large number of visitors among whom we were glad to see many old students. A good selection of music was rendered during the afternoon by the band of the 4th Batt. Gloucester Regiment, under the leadership of Bandmaster P. A. Parks; though their efforts were made more trying by a sharp and nipping Cotswold breeze, which also blew down the dressing tent.

The various events with their winners follow:—

100 YARDS.—Harben, 1; T. A. Scully, 2; F. Scully, 3. Time, 11 secs. Won by a foot.

LONG JUMP.—Ermen, 1, 17 ft. 10 in.; F. Scully, 2, 17 ft. 9 in.

HURDLES.—Harben, 1; T. A. Scully, 2; Symons, 3. Time, 20$\frac{3}{5}$ secs. Won by 4 yards. In the heats F. Scully ran a very close second to Harben.

200 YARDS HANDICAP.—Brigstocke (18 yds.), 1; Harben (scratch), 2; Sherston (10 yds.), 3. Won by 1$\frac{1}{2}$ yards.

HALF-MILE (Open).—Ashton Smith, 1; T. A. Scully, 2; Vickers, 3. Time, 2 min. 23$\frac{1}{5}$ secs.

Throwing the Cricket Ball.—T. A. Scully, 1, 96 yds. 0 ft. 2 in.; Keane, 2, 90 yds. 2 ft. 3 in.

Putting the Weight.—Keane, 1, 33 ft. 3 in.; T. A. Scully, 2, 29 ft. 5 in.

Three Miles.—(First prize presented by Mr. B. S. Cave, C.B.) Hartley, 1; F. Scully, 2; Ratcliff, 3. Time, 18 min. 2 secs.

Bicycle Egg and Spoon.—Eddison, 1; Keane, 2.

Three-Legged Race.—Iredale and F. Scully, 1; Keane and T. A. Scully, 2.

Quarter Mile (Open).—F. Scully, 1; T. A. Scully, 2; Hartley, 3. Time, 57$\frac{4}{5}$ secs.

Walking Race, Two Miles.—(First prize presented by Mr. and Mrs. Swanwick.) Eddison, 1; Keane, 2; W. W. Thompson, 3. Time, 19 min. 43 secs. Won by 100 yards.

Throwing the Hammer.—T. A. Scully, 1, 82 ft. 7$\frac{1}{2}$ in.; Eddison, 2, 61 ft. 3 in.

Tug of War.—Out-Students v. In-Students: Won by the In-Students, two pulls to one.

Mile (Open).—Hartley, 1; F. Scully, 2; Sherston, 3. Time, 5 min. 30$\frac{4}{5}$ secs. Won by half a lap.

Sack Race.—W. W. Thompson, 1; Bell, 2.

High Jump.—Harben, 1, 4 ft. 9 in.; Ermen, 2, 4 ft. 7$\frac{1}{2}$ in.

Half-Mile Handicap.—Henniker (40 yds.), 1; Hartley (scratch), 2; W. Thompson (60 yds.), 3. Time, 2 min. 36$\frac{1}{5}$ secs. Won by 20 yards.

Consolation Race.—Worsey, 1; Adderley, 2.

Costume Donkey Race.—Calder, 1; Farwell, 2. First Costume Prize, Harben; second, Osmond Smith.

T. A. Scully, with 41 to his credit, won the Medal for the greatest number of marks; Hartley and Harben being second with 38; and F. Scully third with 35.

Hartley the Challenge Cups for the Mile and Three Miles, and Harben carried off the Challenge Cup for the winner of the greatest number of marks in the Jumping and Hurdle Race.

In conclusion we can only hope for as large entries and as fine weather for next year's Sports as we have had for this.

DIPLOMA EXAMINATION.

The following students gained the Honour Diploma of Membership at the December examination: Messrs. H. B. Beddall, M. P. Salvago, P. J. Lindsell, E. M. Wason, E. A. Olivera, R. C. Barton, E. Walford, and S. Burrell. The Gold Medal was awarded to Mr. H. B. Beddall, and Silver Medals to Messrs. M. P. Salvago and P. J. Lindsell. Mr. J. M. Bateman obtained the Associateship.

The External Examiners were: In Agriculture, Mr. W. McCracken; in Agricultural Chemistry, Dr. J. A. Voelcker; in Veterinary, Prof. Sir George Brown, C.B.; and in Engineering, Prof. H. Robinson.

OLD STUDENTS.

Mr. Arthur Guillum Scott (R.A.C. 1870-71), who was the first President of the R. A. College Club, has been elected Treasurer and Chairman of the Committee of the Royal Society for the Prevention of Cruelty to Animals, in succession to the late Sir Francis de Winton.

Mr. W. E. G. A. Weigall (M.R.A.C. 1894) is now Agent to the Trustees of the Delapré Abbey Estate, Northampton, to the Earl of Guilford's Glemham Hall Estate, Wickham Market, Suffolk, and Acting Trustee for the Earl of Westmoreland's Apethorpe Hall Estate, Wansford, Northamptonshire.

Mr. S. W. Warner (R.A.C. 1899), Thwaite Hall, Erpingham, Norwich, has been appointed resident agent for the Earl of Orford's estates in Norfolk.

FARM NOTES.

Butter Making Competition.—Keane won the prize, Harben highly commended, and Husain commended.

Farm Excursion.—On March the 20th, an excursion, accompanied by the Professors of Agriculture, Chemistry, and Veterinary, visited the farm of Mr. James Hobbs, of Maiseyhampton, and spent an improving and pleasant afternoon mainly among the stock which he is putting up to auction at Maiseyhampton the end of this month. Mr. Hobbs conducted the party over his farm buildings, and showed it his usual hospitality.

FOOTBALL.

RUGBY.

Characters of the Team.

E. A. Iredale.—Played back this session although really a forward. He tries his best, but will require practice before becoming a safe collar or kick.

G. G. Symons.—An unselfish half-back, who always plays a hard game, saves well, but must learn to get to his man quicker.

W. W. Bell.—Plays a very smart game at half considering he only took to the game this session, he is rather inclined to hesitate at the critical moment.

G. P. Harben.—Has been the mainstay of the three-quarter line. He always gains ground by his strong running, a safe drop kick.

L. Hewett.—A fast three-quarter, takes passes badly, but should improve with practice. He does not always mark his man.

S. Vickers.—Is also a very fast three-quarter, but owing to his not knowing the game, he is rather inclined to forget his man.

H. S. Fagan.—Plays a hard game at three-quarters, but does not always bring his man down, should improve with practice.

R. H. Keane.—Has been a hard-working and energetic Captain under trying circumstances. Has been the mainstay of our scrum.

W. H. Parker.—An extremely good forward, works hard in the scrum, and always brings his man down in the loose, a very safe place kick.

T. A. Scully.—A big, strong, hard-working forward, good out of touch, and has learnt to use his weight in the scrum.

H. Calder.—A very good forward, always on the ball, and does good work in the scrum, tackles well.

G. W. O. Huddart.—Always plays a hard game and saves well, useful out of touch.

T. W. Davies.—A slow, but heavy forward, who has learnt to become much fonder of the scrum. He has done a lot of good work.

G. A. Lambert.—An energetic forward, always on the ball when in the loose, and although light uses all his weight in the scrum.

R. A. Ratcliff.—Plays a very hard and plucky forward game, uses his weight well, and should be very good when he knows the game.

R.A.C. v. Stroud.—This match was played at Stroud on November 16th, and resulted in a defeat for the College by 42 points to nil. The ground was very hard and slippery, but the referee decided that the game should be played. Keane, having lost the toss, kicked off, the Stroud back returning well and finding touch in our 25. A series of scrums ensued, but eventually their halves got possession, and, passing out to their three-quarters, the left wing scored after a brilliant run; the try was unconverted. Beddall kicked off from 25 and found touch near mid-field. From the line out Lindsell obtained the ball, and was brought down about six feet from their line, having put in a very good run. Our opponents scored 2 more goals and a try before half-time. In the second half the Stroud XV. scored 26 more points. Beddall's tackling was the most noteworthy feature of the game, Parker and Keane also playing well; the halves played very well, especially Barton, but the three-quarters were all in very poor form. R.A.C. Team: Burrell, back; Lindsell, Walford, and F. Scully, three-quarters; Barton and Wilson, halves; Keane, Beddall, Wason, Parker, Eddison, T. Scully, Iredale, and Davies, forwards.

R.A.C. v. Magdalen College, Oxford.—This match was played on Nov. 20th, and proved by far the most interesting of the term, the result being a win for our opponents by 6 points. Keane having won the toss, our opponents kicked off, and a series of scrums ensued in mid-field. At half-time our opponents led by 6 points (2 tries) to *nil*. In the second half Walford scored an unconverted try for us after a brilliant run. Our opponents scored again before no-side was called, the final score being Magdalen 3 tries, R.A.C. 1 try. Wilson at half played a very fine defensive game, and his runs and kicks were also excellent. It is pleasant to be able to recall the fact that in one department of the game we have not been outclassed, viz., at half-back. Of the forwards Beddall, Keane, Eddison, and Parker have been considerably the best; all the three-quarters have been distinctly poor, their great faults being that they never marked their men and would not take their passes running. R.A.C. Team: Cocks, back; Lindsell, Walford, Whitehead, and F. Scully, three quarters; Barton and Wilson, halves; Keane, Beddall, Huddart, Parker, Eddison, Burrell, T. Scully, and Iredale, forwards.

R.A.C. v. Berkshire Wanderers A.—This match, the first of the present term, was played on the College ground on the 26th of February, and resulted in a win for the Wanderers by 5 points. The game was a closely contested one, and if our three-quarters had each marked his own individual man we might have been able to have recorded a win. At half-back Bell and Symons played a good game, but were somewhat too slow in getting the ball out to their three-quarters; Bell was inclined to pass rather too high, but he more than atoned for this by his plucky saves. The Wanderers scored a goal in the first half, and led at half-time by 5 points to *nil*. In the second half Davies scored a lucky try for our opponents. Harben scored a really good try for us after a brilliant run; Parker failed to convert. The forwards packed well and played a good game, Keane, Parker, and Calder being especially prominent, and Davies and Lambert good in the open.

R.A.C. Team: Cocks, back; Harben, Hewett, and F. Scully, three-quarters; Symons and Bell, halves; Keane, Huddart, T. Scully, Calder, Parker, Ratcliff, Fagan, Lambert, and Davies, forwards.

R.A.C. v. St. Paul's Training College.—Played on the College ground on March 1st, and resulted in a crushing defeat for our team by 37 points to *nil.* It was most disappointing after the good display our forwards had given in the previous match to find them fall to pieces in such a way. The halves and three-quarters never got the ball, and consequently had no chance whatever to score, as when the forwards did get it they never heeled it out. The game itself calls for practically no comment; Bell and Symons saved time after time in excellent style, but the forwards seemed wholly demoralized, and the three-quarters got no chance. The match eventually resolved itself into a procession towards our goal. R.A.C. Team: Stockwell, back; Harben, Hewett, Vickers, and F. Scully, three-quarters; Symons and Bell, halves; Keane, Parker, Huddart, T. Scully, Lambert, Calder, Davies, and Iredale, forwards.

R.A.C. v. Naunton Park.—This match was played on the College ground on March 8th, and resulted in a decisive win for the visiting team by 41 points to *nil.* Keane won the toss, and elected to defend the goal at the College end. After ten minutes' play our opponents scored an unconverted try. From a series of scrums they again scored, the try this time being converted. At half-time the score was Naunton Park 3 goals 2 tries, R.A.C. *nil.* In the second half Naunton added 20 more points, the final score being as above. This was the last match of the season. It is a matter for regret that the season should have been such a disastrous one, especially as the captain worked so hard to make it a success. R.A.C. Team:—Iredale, back; G. P. Harben, Fagan, Vickers, and Hewett, three-quarter-backs; Symons and Bell, half-backs; Keane, Parker, T. Scully, Huddart, Lambert, Calder, Ratcliff, and Davies, forwards.

ASSOCIATION.

R.A.C. v. Cirencester.—This match was played in Earl Bathurst's Park on March 13th, and resulted in a win for Cirencester by 6 goals to 1. The Town proved themselves much the better eleven, although doubtless the score would have been doubled if their shooting had been better. The College team were without T. A. Scully, and had had very little practice. Blackbourn in goal was very nervous at the commencement, and let two very soft shots through. Prof. Wooldridge played a good game at back, and F. Scully as centre forward was distinctly good. Sewell shot all 6 goals for the Town, and Scully kicked a penalty goal for the College. R.A.C. Team:—Blackbourn, goal; Parker and Prof. Wooldridge, backs; Morrison, Farwell, and Ratcliff, half-backs; Vickers, Bell, F. Scully, Symons, and Fagan, forwards.

R.A.C. GOLF CLUB.

Three matches were played this term, two v. Sapperton, and one v. Marlborough. The results were as follows:—

R.A.C.G.C.		Sapperton.	
E. B. Haygarth	0	J. Rawlins	5
Prof. Paton	8	E. C. Cripps	0
W. W. Thompson	2	H. Rawlins	0
Prof. Blundell	1	E. C. Sewell	0
J. R. Eddison	0	G. Patrick Smith	4
Prof. Locke	0	A. Stuart	0
W. Thompson	3	R. Stuart	0
Prof. Wooldridge	2	Rev. T. F. Burra	0
	16		9

R.A.C.G.C.		MARLBOROUGH.	
E. B. Haygarth	0	H. H. Marriott	4
Prof. Paton	0	Rev. H. R. Ellison	7
Prof. Blundell	0	R. S. Durrant	8
W. W. Thompson	2	A. S. Eve	0
Prof. Locke	0	Rev. C. H. T. Wood	7
W. Thompson	3	G. H. Hughes	0
H. G. Berkeley	4	F. S. Preston	0
C. J. Tunstall	2	C. A. Emery	0
	11		26

R.A.C.G.C.		SAPPERTON.	
E. B. Haygarth	0	J. Rawlins	5
Prof. Paton	2	E. C. Cripps	0
W. W. Thompson	0	A. Stuart	0
Prof. Blundell	15	G. Patrick Smith	0
W. Thompson	6	R. J. Mullings	0
Prof. Locke	6	Rev. T. F. Burra	0
H. G. Berkeley	3	C. L. Tunstall	0
	32		5

At a meeting of the R.A.C. Golf Club on February 20th, it was proposed and unanimously carried that a Silver Medal should be given in conjunction with the Senior Cup.

The Cups were played for on March 27th. The Senior Cup was won by Professor Wooldridge with a return of 97 – 9 = 88, Professor Paton being second with a score of 91 (scratch). The Junior Cup was won by A. D. Waller with a return of 107 – 20 = 87.

SENIOR CUP.		JUNIOR CUP.	
Prof. Wooldridge	97 – 9 = 88	A. D. Waller	107 – 20 = 87
Prof. Paton	91 scr. = 91	H. Browne	115 – 20 = 95
W. W. Thompson	100 – 4 = 96		
Prof. Locke	101 – 5 = 96		
W. Thompson	105 – 7 = 98		
Prof. West	109 – 9 = 100		
Prof. Blundell	107 – 5 = 102		
H. G. Berkeley	110 – 8 = 102		

Two American competitions were played, a single and a foursome. The single was won by W. W. Thompson after a tie with Professor Paton, each having lost and drawn one. The foursome was won by Messrs. Haygarth and Robinson, who were unbeaten.

BILLIARDS.

An American Tournament Handicap, 200 up, was played off during the session between the following competitors:—

	Hcp.		Hcp.		Hcp.
Prof. Paton	Scratch	Hewett	60	Stockwell	90
Prof. Locke	10	Ermen	70	Keane	90
Gamble	10	Worsey	80	Smith	90
Harben	25	Farwell	80	Angell	90
Thompson	25	Bell	85	Stevens	100
Prof. West	35	Iredale	85	Lambert	100
Prof. Wooldridge	50	Adderley	85	Morrison	110
Osmond-Smith	60	Davies	85	Symons	110

The prizes went to 1, Farwell; 2, Hewett; 3, Bell.

CRICKET FIXTURES, 1902.

FIRST XI.

DATE.			MATCH.	PLAYED.
Wednesday,	May	28	XI. v. Rest	Home
Saturday,	,,	31	St. Paul's	Out
Wednesday,	June	4	Stroud	Out
Saturday,	,,	7	Gloucester	Out
Wednesday,	,,	11	Swindon	Out
Saturday,	,,	14	Roseleigh	Out
Wednesday,	,,	18	St. Paul's	Home
Saturday	,,	21	Roseleigh	Home
Wednesday,	,,	25	Cheltenham	Home
Saturday,	,,	28	Cirencester	Out
Wednesday,	July	2	East Gloucestershire	Out
Saturday,	,,	5	Stroud	Home
Saturday.	,,	12	Swindon	Home
Wednesday,	,,	16	Cheltenham	Out
Wednesday, Thursday,	,, ,,	23 24	Old Students	Home
Saturday,	,,	26	East Gloucestershire	Home
Wednesday,	,,	30	Gloucester	Home
Saturday,	August	2	Cirencester	Home

SECOND XI.

DATE.			MATCH.	PLAYED.
Wednesday,	June	4	Cricklade	Out
Saturday,	,,	7	Malmesbury	Home
Saturday.	,,	14	Malmesbury	Out
Wednesday,	,,	18	Roseleigh 2nd XI.	Out
Saturday,	,,	21	Phœnix	Out
Saturday,	,,	28	Cirencester 2nd XI.	Home
Wednesday,	July	9	Cricklade	Home
Wednesday,	,,	16	Roseleigh 2nd XI.	Home
Saturday,	,,	19	Phœnix	Home
Saturday,	August	2	Cirencester 2nd XI.	Out

REVIEWS.

COST OF CULTIVATING FARM AND MARKET GARDEN CROPS. By Cecil H. Hooper, F.S.I., M.R.A.C. Reprinted by permission from the Professional Notes of the Surveyors' Institution, Vol. XI., Part 1. Price 1s.

This is a compilation showing the estimated costs of manual and horse labour on agricultural, fruit, and vegetable crops. It appears to have been compiled with care and skill. Students may obtain copies from the author, at Highlands, Swanley, Kent, at half-price.

ANNUAL REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, BOMBAY PRESIDENCY. Bombay, 1901.

This is an account of the cultural, dairying, and breeding operations conducted on the Government Experimental Farms at Poona and Surat, during the year ending March 31st, 1901. This report, which is shorter than usual, has been written and presented by Mr. P. R. Mehta, M.R.A.C., the Acting Deputy Director, in the absence of Mr. J. Mollison, M.R.A.C., the Deputy Director of Agriculture. It shows that a good deal of valuable experimental work, especially in manurial experiments, and in trials of new species of plants and new varieties, can be carried on at little expense to the Government. We are glad to notice that in a trial plot at Poona with an old friend, the soy bean, the plants grew to the height of two feet and produced an enormous number of beans, and that steps have been taken to grow a much larger area, and to distribute seeds to other experimental farms.

JOURNAL OF THE DEPARTMENT OF AGRICULTURE OF WESTERN AUSTRALIA. Vol. V., Part 1. January, 1902. Perth, W.A.

Among the articles in this number is one on "Cool Fermentation," by A. Despeissis, M.R.A.C. ; on the Archipelago of Houtman's Abrolhos by R. Helms ; these islands now yield guano, of which there appears to be about 100,000 tons available, of recent origin ; a note on the destruction of Prickly Pear by means of a solution of sodium arsenite shows the operation to have been eminently successful and without detriment to the grass, this information should be valuable in other countries where the prickly pear becomes a pest ; the solution used seems to have contained about 1 per cent. of arsenic. "Plain Talks on Manures," by P. C. Wicken, is continued from Vol. IV. ; its value would be increased if the calculations were checked ; we notice two or three errors in this issue. Also why introduce a new eccentricity into the spelling of the word Kainite, we cannot regard *Kainait* as an improvement.

Vol. V., Part 2. February, 1902.

This number contains, amongst other matter, a paper by A. Despeissis on extracting the alcohol from the skins left on fermentation of grapes, and obtaining a *piquette* containing most of the alcohol in a suitable condition for distillation. It also contains a reprint from the *Agricultural Students' Gazette* of Professor Woodruff's Article on "A Contrast in Conformation : Hunter v. Shire," though unfortunately the source of the Article is not acknowledged.

JOURNAL OF THE DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION FOR IRELAND. Vol. II., No. 2. December, 1901. Dublin, 6d.

This Journal continues to keep up to its high standard, and supplies much useful information to the Irish agriculturist at a very low price. This number contains useful notes on early potato growing, including the selection of varieties, manuring and other treatment, such as sprouting in boxes before planting, which is a great advantage. A note to this paper gives the results of some sprouting experiments with late potatoes carried out in County Tyrone ; the sprouted seed is said to have given from 2 tons 6 cwt. to 3 tons 6 cwt. more potatoes per statute acre than the unsprouted seed, but, as the total yields per acre are stated to be from 13 tons 1 cwt. to 22 tons 16 cwt. per acre, we should certainly like further information about these remarkable crops. The average yield of potatoes in Ireland is less than 5 tons per acre. Other agricultural papers are on "Field Experiments and Demonstration Plots" ; the use and purchase of manures ; the Canadian store cattle trade ; and various official documents and statistics. The English Board of Agriculture might take some useful hints from the Irish Board in conducting its Journals.

SOFT PORK ; AN INVESTIGATION INTO ITS CHARACTER AND CAUSES. By F. T. Shutt. Bulletin No. 38, of the Central Experimental Farm, Ottawa, Canada. October, 1901.

This subject is a most important one, especially for Canada and the United States. Mr. F. T. Shutt, Chemist, of the Dominion Experimental Farms, with the assistance of Mr. J. H. Grisdale, Agriculturist, has carried out an investigation involving an immense number of analyses and observations. He shows conclusively that in soft bacon the fat differs in composition from that of firm bacon, in that whilst the fat of the latter contains 35 or 36 per cent. of palmatin and stearin and about 64 per cent. of olein and linolein, in the fat of soft bacon there is but about 20 per cent. of the solids palmatin and stearin, and about 80 per cent. of the liquids olein and linolein. In the fat of immature bacon the differences may be even greater than this. About 73 per cent. of olein appears to be near a standard, less than this gives firm bacon and more gives a soft bacon. A very large number of feeding experiments were made ; some of the more important inferences drawn were these :—That of all the grain rations employed, a mixture in equal parts of oats, peas, and barley gave the finest pork, and this ration gave a very thrifty growth. If half the corn ration consists of maize, there is a tendency to softness in the product. When maize is fed exclusively, as the grain ration, whether dry or soaked, the percentage of olein in the fat is increased, the bacon is of inferior quality, and the growth of the animals is poor. Beans also produce a soft and inferior bacon, and the growth of the pigs so fed is poor and miserable. If Indian corn or beans be used they must be fed judiciously; in conjunction with skim milk a considerable proportion of maize may be used without injury to the quality of the bacon. Skim milk not only tends to thriftiness and rapid growth, but counteracts in a very marked manner any tendency to softness. Green or succulent food like rape, pumpkins, artichokes, sugar beets, mangels, or turnips can be fed in a good ration without injury to the quality of the bacon. The fat of very young pigs and animals of unthrifty growth is softer than that of finished pigs that have increased steadily to the finishing weight. A photograph of a group of pigs fed on maize meal and skim milk, with an adjacent group fed on maize meal only, forms a very striking object lesson.

HANDBOOK OF INDIAN AGRICULTURE. By Nitya Gopal Mukerji, M.R.A.C. Calcutta: Thacker, Spink & Co. 1901. pp xxv. and 894.

The author of this work was Holland Gold Medallist at the R.A.C. in 1886, and is now Professor of Agriculture and Agricultural Chemistry at the Civil Engineering College, Sibpur, Bengal. In the meantime he was, among other labours, investigating the silk-worm diseases in Bengal. The book is practically a publication of the author's lectures at Sibpur, it pretends to little originality, but brings together in a systematic manner notes, reports, monographs, and papers in Journals of matters bearing on Agriculture and Agricultural Chemistry. Notes from Cirencester (why spell it Cirenscester?) lectures have, we are glad to see, been freely used. The volume is an admirable effort towards the improvement of Indian Agriculture, and appears to be a perfect mine of useful information. It illustrates to a remarkable degree the great capacity possessed by many natives of India of acquiring knowledge, and is a work of painstaking industry. Mr. N. G. Mukerji's adaptation of this knowledge to Indian requirements is not so convincing. It reminds us of the image of Nebuchadnezzar's dream, with head of gold, body and limbs of good metals, supported on feet of clay. The author, as Agricultural Lecturer at the Sibpur College, is evidently in an unique position to conform his education to Indian requirements. He has already done something, and by thorough investigation should be able to do much more towards putting more aluminium into the feet. To others interested in this research, this book is undoubtedly what its author chiefly claims for it, a useful text book, with ready-to-hand information carefully collected from East and West, and should be in the hands of all Government officials, planters, and others connected in any way with the soil. It has unfortunately been hurried through the press, so that whilst there are no less than six pages devoted to *errata*, there are still others uncorrected. No sample of silage containing less than 7 per cent. of water, as on page 850, exists—unless when artificially dried. These things will doubtless be corrected in a new edition, when also the author would do well to give references to more of his sources of information.

THE JOURNAL OF THE SOUTH-EASTERN AGRICULTURAL COLLEGE, WYE, KENT. No. 11. February, 1902. Headley Brothers, Ashford, Kent. 1s. 8vo., pp. 144.

This is a particularly good issue of the Kent and Surrey College Journal; it contains the results of Experiments on Hops, by the Principal, A. D. Hall, and J. Percival; numerous Notes on Economic Entomology, by F. V. Theobald, and a paper on the Black Currant Bud Gall Mite, by E. J. Lewis, with illustrations. Mr. John Percival contributes eight notes and observations on Plant diseases occurring in 1901. A paper by A. D. Hall and F. J. Plymen, on the Use of Weak Solvents in Soil Analysis is practically reprinted from the *Journal of the*

Chemical Society. The Principal also contributes a paper on the Food Value of Sugar Beet, which does not tend to encourage its cultivation ; and he has another paper on the Composition of English Barley. Mr. W. E. G. Atkinson has a paper on the Influence of Food on the Quality of Milk, which tends to show that that influence is a vanishing quantity. Mr. F. B. Smith has a paper on the Growth of Maize, with records of experiments with different varieties carried on at Wye. Various notes, meteorological observations, College news, &c., complete the number, which is remarkably well got up and printed.

The Irish Problem and How to Solve it: by Dudley S. A. Cosby. London: R. Brimley Johnson. 1s. 6d. nett.

This book, written by a former R.A.C. student, throws a certain amount of light on the position of the land question in Ireland from the landlords' point of view. To the English reader it will probably convey, in an attractive form, a good idea of the difficulty which the Government find in adjudicating between landlord and tenant, for it presents very clearly some of the causes of disagreement. We should, however, recommend those who read it to proceed in accordance with the maxim—*audi alteram partem*—and, as about half of the entire publication is described in the author's words, as "a rejoinder to Mr. T. W. Russell," read first the speech of the member for South Tyrone upon compulsory purchase, which has been published in pamphlet form. We must confess to being rather disappointed that the author did not, on reprinting these articles from the *Westminster Review* in book form, so modify his statements as to conform to the calmer atmosphere of literary prose, rather than fill them with the storm of public passion and the whirlwind of platform utterance, which is undoubtedly the style exhibited by Mr. Russell. For example, when the author suggests that Mr. Russell is a Home Ruler at heart whilst a Unionist by profession, he is apparently guilty of entire disregard of facts, for few men have worked so hard for any political cause as Russell did, not only in Ireland but also in English constituencies in 1886 for the Unionist cause ; and if he since had changed his views he is not the man to cloak them over, as witness his display of views upon the University Education question, which, in his constituency, are highly unpalatable. Perhaps the weakest point in the book is the fact that the author regards the tenants throughout as "Protestant-hating," in spite of the fact that Mr. Russell, the farmers' idol, is as much supported by the Protestant farmers as by the Catholic, which is evidenced by the return at the recent bye-election in East Down of the Russelite, as further by the fact that with one exception all Protestant members from Ulster had to declare themselves for compulsory sale to retain their seats at the last general election. It seems to us that the author tries to attribute the ill feeling between landlord and tenant to religious differences, which admittedly are deplorably bitter in Ireland ; but the acute differences between landlord and tenant being no less marked in the North than elsewhere, the theory upon facts becomes untenable ; indeed it seems that the one subject upon which comparative unanimity exists in Ireland is the land question. Having briefly noted a few of the most obvious defects of the above work, there remains the more pleasing duty of pointing out its greatest merits ; the foremost amongst these is the truly pathetic manner in which the case of the landlords of Ireland is depicted by a mathematical comparison of their former incomes with their probable incomes in case Mr. Russell's scheme were carried out, and this as an appeal to our sympathy with the suffering is an effort of no mean order. The forcible way in which the conclusions of the Fry Commission are stated, and the care with which the natural bias of its members is not so much as hinted at, makes us admire the diplomacy and tact of a writer who freely admits that his articles are in the defence of the landlord party. Another point in favour of this little work is the thorough manner in which it is indexed, so that any point to which reference is desired may be found without any appreciable loss of time. The book is very cheap and is therefore within the reach of all, and it certainly rewards perusal by all those interested in the vexed and complex Irish Land Question. G. T. L.

Erratum **in last issue, page 138, line 9, *for* 400 *read* 40.**

AGRICULTURAL STUDENTS' GAZETTE.

EDITED BY

STUDENTS AT THE ROYAL AGRICULTURAL COLLEGE,

CIRENCESTER.

NEW SERIES.

VOL. X.

1900-1902.

ALL RIGHTS RESERVED.

CIRENCESTER: ALFRED T. HARMER, MARKET-PLACE.

CIRENCESTER:
PRINTED BY GEORGE H. HARMER, "STANDARD" OFFICE.

INDEX TO VOL. X.

A. PAGE

Abortion in Cattle 83
A Contrast in Conformation, Hunter v. Shire 144
Agricultural Education 19, 113, 160
Agriculture in the Isle of Wight 48
Agriculture in the Sudan ... 92
A Philosopher of the Cotteswolds 175
Athletic Sports 80, 188
At the Front 23, 49, 93, 159, 183
Aynsome Experiment Station, Lancashire 91

B.

Baroda: Its Agriculture and Agriculturists 105
Berkshire Pigs, Mr. Russell Swanwick's 122
Billiards 96, 165, 194
"Bobby": An Appreciation ... 111

C.

Chlorine in Rain Water 24, 53, 93, 160
College Notes 24, 55
Competitions 159
Cricket 26, 58, 97, 124, 160, 195

D.

Diploma Examinations 22, 93, 124, 159, 190

E.

Equipment of a Norfolk Farm 183
Experiments on Pasture 16, 117

F.

Farm Fences 170

PAGE

Farming in India 140
Farming in Natal 42
Farm Notes ... 56, 120, 191
Foot and Mouth Disease: with an Account of the Outbreak in Suffolk in 1901 135
Football 59, 94, 162, 191

G.

Gilbert, Sir Joseph Henry ... 167
Glasgow University and the R. A. College 124
Golf Club 57, 97, 133, 165, 193

H.

Hankow and Neighbourhood ... 7

I.

Industrial and Loan Exhibition 156

L.

Lawes Portrait Fund 67
Lawes, Sir John Bennet .. 37
Lawn Tennis 24, 132
Literary and Debating Society's Dramatic Entertainment ... 51
Literary and Debating Society's Musical Entertainment ... 50

N.

Notes on Fruit Culture... ... 178
Notes on the Presence of Tubercle and Diphtheria Bacilli in Milk 70

O.

Obituary 55, 90, 103, 167

PAGE

Of Thomas Tusser. "Five Hundred Points of Good Husbandry" 44
Old Students 23, 54, 93, 123, 159, 191
Orchards 11

R.

Reviews 33, 64, 98, 134, 166, 195
Royal Agricultural College Club 50, 158
Royal Agricultural College Theatricals 155

S.

Scholarships 93, 159
Sir Joseph Henry Gilbert ... 167
Sir John Bennet Lawes... ... 37
Steeplechase 57, 162
Students' Gazette ... 92, 123
Sugar Cane Cultivation in Barbadoes 149

PAGE

Swanwick's, Mr. Russell, Berkshire Pigs 122

T.

The Art of Observation ... 142
The Preservation of Timber by Artificial Means 74
The Reception by Flowers of Unbidden Guests 180
The Royal Agricultural College: Patron, King Edward VII. 67
The Surveyors' Institution 23, 93, 124, 158
The Workman's Compensation Act, 1901 68

V.

Visit to the Bath and Western Counties Agricultural Show 20
Visit to Buscot Park 20

W.

Wheat Raising in Foreign Climes 1
White Scour in Calves 185

630.5
AGT
v.11

LIBRARY OF THE
DEC 4 - 1930
UNIVERSITY OF

NEW SERIES.

Agricultural Students' Gazette.

Vol. XI. DECEMBER, 1902. No. 2.

MANURIAL EXPERIMENTS ON PERMANENT GRASS AT THE ROYAL AGRICULTURAL COLLEGE, CIRENCESTER.

Experiments in Field No. 13, on Permanent Grass, were begun in 1888, and have been continued on the same plots every year since. The soil is a calcareous loam, resting on the Great Oolite; the surface soil is fairly rich in the necessary ash constituents (especially in potash), and in combined nitrogen; but it is rather shallow, being deeper and of better staple towards the east of the field: *i.e.*, plots 9 to 14 and B1, B2, and B3, than at the west end: *i.e.*, the A plots and 1 to 4.

Each plot is one-twentieth of an acre. The first crops only were weighed, and after this the whole field was grazed each year with cows and sheep.

Plots 1 to 14 were started in 1888; A1 and B1, farmyard manure plots, in 1889; A2 and B2, basic slag, and A3 and B3, rape meal, in 1892. The crops were not weighed in 1888, nor in 1893, in which latter year they were very small; so the averages given below apply to the first crops on 16 plots for 13 years, and on 4 plots for 10 years.

The manures used were the same in amount every year, and these are the quantities used per acre:—

Farmyard Manure	12	tons.
Nitrate of Soda...	2½	cwts.
Sulphate of Ammonia	2	cwts.
Superphosphate	5	cwts.
Kainite	5	cwts.
Peruvian Guano...	5	cwts.
Basic Slag	10	cwts.
and Rape Meal	5	cwts.

The guano varied in quality a little in different years between 8 and 10 % ammonia and 25 % to 32 % of phosphates; the superphosphate was 26 % soluble; the kainite 12·5 to 13·5 % of potash; the basic slag 35 to 40 % of phosphates; and the nitrate, ammonium sulphate, and rape meal of ordinary good commercial quality.

The farmyard manure was applied the previous autumn or winter; the kainite, slag, and rape meal were, in the first years, applied in February, but latterly in December of the previous year; the superphosphate and guano are generally applied in February, or early in March; the sulphate of ammonia about the middle of April, and the nitrate of soda about a fortnight later, the end of April or beginning of May. The hay harvest has generally been between June 13th and 20th, but in 1890 and in 1891 was in July.

The weight of the heaviest and lightest crops, and also the average of 13 (or 10) years was as follows, in cwts. per acre :—

No. of plot.	Highest.	Lowest.	Average.	In excess of unmanured.
0. Unmanured	32⅝ (1898)	10 (1901)	21½	—
2. Kainite, 5 cwts.	29⅝ (1898)	7½ (1901)	19⅞	—
13. Superphosphate, 5 cwts.	35 (1890)	10 (1896)	25	3½
A2 & B2. Basic slag, 10 cwts.	36¼ (1902)	9⅞ (1892)	24½	4⅜*
A3 & B3. Rape meal, 5 cwts.	38⅜ (1898)	10¾ (1892)	26	5⅛*
3 & 12. Guano, 5 cwts. ...	46⅜ (1898)	12½ (1901)	31⅜	9⅞
1. Nitrate of Soda, 2½ cwts.	38¼ (1898)	8½ (1901)	24¼	2¾
9. Sulphate of Ammonia 2 cwts.	41 (1898)	13¼ (1901)	30¼	8¾
5. Kainite and Superphosphate	39 (1890)	16 (1892)	28⅞	7⅜
10. Kainite and Nitrate ...	47⅝ (1890)	14⅛ (1901)	32¾	11¼
11. Kainite and Sulphate of Ammonia	48¼ (1898)	15⅜ (1892)	33½	12
14. Superphosphate and Nitrate	52½ (1898)	19 (1892)	36⅞	15⅜
4. Superphosphate and Sulphate of Ammonia	52¼ (1890)	14⅝ (1901)	34⅝	13⅛
6. Kainite, Superphosphate, and Nitrate	56¼ (1890)	22 (1901)	38½	17
8. Kainite, Superphosphate, and Sulphate of Ammonia ...	50⅜ (1898)	19⅞ (1901)	35⅞	14⅜
A1 & A2, Farmyard manure, 12 tons	55⅝ (1898)	11 (1892)	36	14½

* These are averages of ten years only, and the excess is over the corresponding ten years of the unmanured plot.

The worst years were 1892 and 1901, when the average yields of all the plots were respectively 14¼ and 15⅝ cwts. The best years were 1890 and 1898, when the averages of all the plots were 43⅛ and 43 cwts. respectively.

The series of years comprising these experiments included several dry seasons, in which manures of any kind had less than their usual chance of producing good effects. Thus, in 1892, when farmyard manure had practically no effect either on the experimental plot or on adjacent parts of the field, the rainfall from January to June 22nd was only 7·38 inches (the average being 13½ inches), and during the months of March, April, and May, the rainfall was but 2·51 inches; also, in this year, there were 28 frosty nights in March, 24 in April, 9 in May, and 7 in June.

In 1893 (in this year the hay was not harvested) the rainfall in March, April, and May was collectively 1·81 inches.

In 1896, the average of all the plots was 20 cwts. per acre, and the rainfall from January 1st till hay harvest was 5·88 inches, that in April and May being only 1·1 inches.

In 1901, also, the rainfall was below the average in the early months, and very little fell after nitrate had been applied.

PRODUCE IN HAY IN HUNDREDWEIGHTS, CALCULATED PER ACRE.

PLOT ..	A3	A2	A1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	B1	B2	B3	
MANURE	Rape Meal.	Basic Slag.	Farm-yard Manure.	Nitrate of Soda.	Kainite.	Peruvian Guano.	Superphosphate. Ammonium Sulphate.	Kainite. Superphosphate.	Kainite. Superphosphate. Nitrate of Soda.	Unmanured.	Kainite. Superphosphate. Ammonium Sulphate.	Ammonium Sulphate.	Kainite. Nitrate of Soda.	Kainite. Ammonium Sulphate.	Peruvian Guano.	Superphosphate.	Superphosphate. Nitrate of Soda.	Farm-yard Manure.	Basic Slag.	Rape Meal.	General Average.
Year.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
1889	—	—	40⅞	33	23⅝	31¼	36⅜	31⅝	37½	23¼	35¾	32⅛	39½	36⅜	32½	30⅞	41¾	41¾	—	—	34⅛
1890	—	—	45¾	35¾	28¾	44⅝	52¼	39	56¼	31¼	50	40⅛	47⅝	45⅜	44½	35	47⅞	45⅞	—	—	43⅛
1891	—	—	40¼	33¼	23¼	30¾	36¾	33⅜	47½	23	42	33¾	42⅛	39½	33¾	31⅜	48	42¾	—	—	36⅜
1892	11¼	11⅝	11	10¾	10⅞	14⅞	19⅛	16	22⅛	12½	20	16	19	15⅜	13¼	10	19	11⅝	9⅞	10¾	14¼
1893	Not weighed			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1894	26⅝	31⅜	35⅞	25	20⅞	34½	37⅛	32	42	21⅝	36¾	34¼	31¼	37½	40⅞	33⅜	35¾	46¼	34⅛	37⅛	33¾
1895	27¾	24½	31½	21¾	27	38¼	40	35½	38½	26	38¾	37½	36½	39¼	41¾	18¾	38¼	41½	35¼	34¼	33
1896	21½	15¼	24¼	16	16½	25⅜	27⅛	16¾	28½	15½	24¼	21¼	20⅜	21½	20	10	20⅜	22⅛	12¼	19⅞	20
1897	32	28½	37⅞	24¼	23⅜	38⅛	42⅞	30½	43⅜	21⅜	41⅜	38¾	39½	40	35	25⅜	35	40¾	28⅞	32⅞	34
1898	39¼	35⅜	53⅞	38¼	29⅝	47⅞	48¾	38⅞	53½	32⅝	50⅜	41	46⅜	48¼	46⅜	33	52½	55⅝	32	37⅝	43
1899	26⅜	24⅛	33½	22⅞	18	28½	37⅛	28⅞	36⅞	21¾	38	31¾	32⅛	32⅝	28⅞	25¾	40¾	40	25	25	30
1900	19⅛	22⅛	30⅜	22	14½	19⅝	23⅞	23¼	28¼	20	28⅝	27⅞	25	28½	22⅝	22⅛	34⅛	34¼	22⅛	25	24⅝
1901	13	11⅜	20	8½	7½	12½	14⅝	17⅜	22	10	19⅞	13¼	14⅛	18⅝	19½	16¼	20⅜	24	13⅝	16⅝	15⅝
1902	32½	35⅝	40¼	23⅞	14½	36	34⅞	32⅝	43¾	19⅞	40⅛	26	33⅛	33⅜	36½	34	45	43⅛	37	33⅜	33¾
Average	24⅞	24	34¼	24¼	19⅞	30⅞	34⅝	28⅞	38½	21½	35⅞	30¼	32¾	33½	32	25	36⅞	37¾	25	27¼	30

In 1898, which was a good hay year, the rainfall of the first six months was much below the average, being 7·48 inches only till cutting; but it was well distributed and the fall in April and May was 4·82 inches.

In eight years kainite alone has given a less yield than the unmanured, in three years basic slag alone has given less hay, in three years superphosphate alone, in two years rape cake alone, in one year guano alone, in three years nitrate of soda alone, and in one year (1892) farmyard manure has given less hay than the unmanured plot.

The B plots and those at the west end of the field gave, on an average, about 2 cwts. of hay more than the corresponding A plots; on the farmyard manure plots, the difference was greater, between 3 and 4 cwts.

It will be noticed that the kainite alone on this soil has diminished the yield of hay; this appears to be due to its effect in encouraging the growth of bird's foot trefoil, *Lotus corniculatus*, which is very much in evidence on the plot and is but a light cropper.

Phosphates alone, either in the form of superphosphate or basic slag, the latter applied in large doses, have given but little increase; during the first years of the experiments, superphosphate alone gave a profitable increase; but this is not kept up in later years. Kainite and superphosphate applied to the same plot have always given a fair increase, and on this plot, clovers, especially the small yellow clover, *Trifolium minus*, have very greatly increased.

Guano has given almost always a fair increase and sometimes a large one, and the quality of the hay is always very good; with the quantity of guano used, the increased yield of hay is not generally remunerative, unless the quality be of prime importance.

Nitrate of soda alone has, on the average, given but a small increase, 2¾ cwts.; in three years, 1892, 1895, and 1901, there was less on this plot than on the unmanured; two of these were dry seasons, and in 1895, only 1·22 inches of rain fell after the application of nitrate till harvest, and more than half of this was in one day in a thunderstorm. During the first three years of the application of the nitrate there was a much larger increase in the hay crop.

Sulphate of ammonia alone on this soil, and under the conditions here obtaining, has given a much better increase in the hay crop than nitrate alone; and the increase has, so far, been well maintained; the soil has abundance of calcium carbonate.

A little of the superior effect of the ammonia salt is due to the position of the plots in the field, the ammonia plot being a little better soil than the nitrate plot; but the main reason is probably that the sulphate of ammonia was applied earlier; and in some of the dry seasons of the last decade the nitrate had no chance of acting as plant food, and was even detrimental to the first crop. No doubt, had it been applied earlier, better results would have been obtained. But it is noteworthy that where nitrate was used on a plot to which kainite had been previously applied very satisfactory results were obtained, an

AGT
V. 11 2

increase of over 11 cwts. of hay on the average; this result suggests that there may be some physical action playing a part when the manures are used in conjuncture.

Sulphate of ammonia with kainite gave a slightly better return, the increase being 12 cwts. of hay.

Superphosphate and sulphate of ammonia gave an increase, on the average of the thirteen years, of 13 cwts. of hay; and superphosphate and nitrate of soda a still better increase of $15\frac{3}{8}$ cwts.

A mixture containing the principal ash constituents and nitrogen, in the form of kainite, superphosphate, and sulphate of ammonia, gave a little better result than the two latter manures alone; and, similarly, a mixture of superphosphate, kainite, and nitrate of soda gave a little higher yield than superphosphate and nitrate alone, and, indeed, gave the highest yield of the series.

Farmyard manure, 12 tons, gave an average increase of $14\frac{1}{2}$ cwts. of hay; and, in 1898, gave the heaviest crop of any plot.

The order of the yield of hay has been—1st, mixture of artificials with potash, phosphates, and nitrate; 2nd, phosphates and nitrate; 3rd, farmyard manure; 4th, potash, phosphates, and sulphate of ammonia; 5th, phosphates and sulphate of ammonia, followed by potash and ammonia; potash and nitrate; and guano.

The main lessons to be learnt from these experiments seem to be that, on these soils, no one simple manure, *i.e.*, potash alone, phosphates alone, or nitrogen alone, is economically effective on grass. Any mixture is better, but a complete mixture is best.

This soil for grass, and no doubt for cereals, requires specially phosphates and nitrogen, and this, or a mixture with the addition of a little kainite, alone of the artificials, gives a remunerative return during a series of years.

Somewhat smaller quantities of the artificials, especially of kainite, would be recommended in actual practice, and, speaking generally, these manures should be applied somewhat earlier in the season than is the usual custom.

When quality is of great importance, guano is the best of the purchased manures.

On this soil, superphosphate appears to be generally preferable to basic slag.

During the first three years of the use of superphosphate, this alone gave an increase of respectively $7\frac{5}{8}$, $3\frac{3}{4}$, and $8\frac{3}{8}$ cwts. of hay; though in later years the increase diminished, as was to be expected when superphosphate alone was used.

EDWARD KINCH.

A NEW DEPARTURE IN THE SCIENCE OF FATTENING.

By R. WARINGTON, F.R.S.

Those who have made themselves acquainted with the feeding experiments on oxen carried out by Dr. O. Kellner and his numerous fellow workers at the Experiment Station at Möckern cannot fail to have been struck with the extraordinary accuracy and thoroughness with which the investigations have been conducted. The experiments occupied four years, and were carried out on a large number of oxen. The gain or loss of substance to the animal was not calculated from the gain or loss of live-weight—a method which is liable to great inaccuracies—but from the ascertained gain or loss of nitrogen and carbon; the former ascertained by a comparison of the nitrogen in the food with that found in the solid and liquid excrements, the latter found by comparing the carbon in the food with that leaving the animal in the excrements, and as carbon dioxide and methane in the gases from the lungs and intestines. The determination of the balance of carbon in the animal body was naturally of preeminent importance, as the most variable constituent of the animal body is fat. To ascertain the gain or loss of carbon in the oxen they had from time to time to be placed in a respiration chamber, and while there the whole of the air entering and leaving the chamber was measured, and its contents in carbon dioxide and methane determined. In all, 159 determinations were made in the respiration chamber, and in each case the ox remained in the chamber for 24 hours; the results obtained were thus the average of day and night, and represented as far as possible the real changes in progress in the animal. This long stay in the respiration chamber has been seldom attempted before, and required special arrangements for feeding the animal, and attention to a variety of other circumstances for its success.

Every feeder of cattle knows that one animal may fatten more easily than another; the results obtained by supplying a fattening food to some cattle will not therefore necessarily be repeated when similar food is given to other cattle. The oxen employed by Kellner were not all alike in their capacity for fattening, but his determinations of the relative fattening values of starch, sugar, cellulose, oil, gluten, hay and straw, were made exact by ascertaining the fattening value of starch with every animal, and in each series of experiments; the relation of the other foods to starch was thus ascertained independently of any individual peculiarity of the animal.

Kellner's determinations of the relative values of the typical constituents of food for the production of fattening increase are of very high practical importance, as they apparently provide the data for calculating the relative values of ordinary cattle foods when these are employed for fattening purposes. The following numbers represent the equivalent quantities of the digestible matter of various foods and food constituents producing the *same amount* of fattening increase when added in moderate quantity to a general diet under which the oxen were slowly gaining in weight. The figures are the mean of Kellner's results.

Starch	100
Molasses	97
Straw pulp	96

Wheat gluten	99
Earthnut oil	45
Meadow hay	147
Oat straw	157
Wheat straw	374

It appears from these results that starch, sugar, digestible cellulose pulp,* and digestible albuminoids have very nearly the same value as producers of increase when used as ingredients of a suitable diet, but that digestible oil has a considerably greater value, 45 parts of oil producing as much increase as 100 parts of starch. These results are pretty much what we should have expected from the comparative calorific value of the substances in question.

When we come, however, to the digestible part of meadow hay, oat straw, and wheat straw, we find that its capacity for producing increase in a fattening ox is far below that of an equal weight of starch. From a purely chemical point of view the fact is astonishing, as these foods consist principally of cellulose, a substance having the same calorific value as starch. Moreover Kellner's experiments have shown that when used for a maintenance diet the digestible matter of oat straw and meadow hay are equal to starch in value, and wheat straw but little below it. The explanation of the great inferiority of fibrous foods when used for fattening purposes we now know is to be found in the large amount of energy, in the form of mechanical work, consumed during the laborious mastication and digestion of fibrous foods; this energy finally appears in the animal as heat, and may thus effectually take part in maintaining the life of an animal, but is valueless for the production of increase, or for enabling the animal to perform external work. These facts have been admirably brought out in Zuntz's investigations on the nutrition of the horse, to which we cannot now refer in detail. That the inferior results given by fibrous foods when added to a maintenance diet for the purposes of fattening were due to their mechanical condition, and not to any inherent worthlessness of the cellulose of which they are chiefly composed, is also shown by the fact that Kellner found straw pulp quite equal to starch as a fat producing food, although straw itself proved so much inferior. The great inferiority of wheat straw to good oat straw in his experiments with fattening oxen is another fact indicating the same conclusion.

I need hardly say that practical men have long ago recognised the very low fattening power of hay and straw. The chemist, on the other hand, has been naturally inclined to believe that the *digestible* part of hay and straw must have a nearly similar nutritive value to that possessed by other digestible carbohydrates, and has felt disposed to attribute any difference that might be apparent to the particular chemical properties of some of the many substances which together constitute vegetable fibre. There is very little evidence, however, at present that the various constituents of digestible vegetable fibre have a different nutritive value, and it may be here remarked that the straw pulp which proved so successful as a food contained about one-third its weight of furfural yielding bodies, probably oxycellulose; pentosans would probably be absent as the straw had been boiled in alkali.

---

* The straw pulp prepared by paper makers by boiling straw with alkali under high pressure was the kind used for the feeding experiments.

The view taken by the chemist has undoubtedly led to a greater value being given to hay and straw in our tables of the comparative value of foods than is true when these foods are employed for fattening purposes, but the fundamental conception of the chemist was right, digested cellulose had the nutritive value which he supposed, but *it cost the animal so much to digest it* that the net value to the animal was very seriously reduced.

When account is taken of the waste of energy during the passage of vegetable fibre through the alimentary canal, the residual nutritive value of the fibre for the animal becomes a very variable quantity. It will depend largely on the original condition of the fibre, the soft fibre of hay consuming much less energy during mastication and digestion than the hard fibre of wheat straw. It will depend also on the efficiency of the digestive apparatus, and the nutritive value of cellulose will be greater in the case of a ruminant animal, as an ox or sheep, than in the case of a horse; indeed Zuntz's results show that when wheat straw is consumed by the horse there is actually a greater consumption of energy than can be supplied by the oxidation in the body of the digested straw; so that as far as the production of increase or external work is concerned, the effect of the straw is not only nothing, but is actually a considerable negative quantity.

In preparing the new edition of the *Chemistry of the Farm*, I had carefully to consider whether the facts ascertained by Kellner's extensive investigations supplied sufficient data for calculating the comparative fattening value of foods. In calculating the comparative value of foods for mere animal maintenance no difficulty occurred; the digestible fibre had in this case a similar heat-producing value to starch, and might be reckoned as equivalent to starch even in the case of the horse, provided only that in the case of the horse about one-third of the energy developed in the body from food must, according to Zuntz, be derived from other food constituents than fibre, so as to supply the animal not only with heat but with material for the performance of the internal work of the body. The difficulty which had to be faced was the value of digestible fibre, when added to a maintenance diet, for the purpose of fattening. From what has been already stated it will appear that a truly exact comparison of different foods containing vegetable fibre can only be arrived at by actual experiments with the foods themselves, the precise condition of the fibre in each food being more or less unknown without such actual trial. Except, however, in the case of a few foods, as undecorticated cotton cake and brewers' grains, the quantity of fibre introduced into the animal system is but small unless

NEW SERIES.
Vol. XI. Part 2.
DECEMBER, 1902.
Price 1s.

THE LIBRARY OF THE
DEC 4 - 1930
UNIVERSITY OF ILLINOIS

AGRICULTURAL STUDENTS' GAZETTE.

EDITED BY

STUDENTS AT THE ROYAL AGRICULTURAL COLLEGE,
CIRENCESTER.

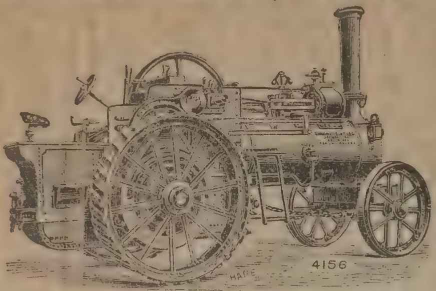
CONTENTS.

	PAGE
Manurial Experiments on Permanent Grass at the Royal Agricultural College, Cirencester. Edward Kinch	31
A New Departure in the Science of Fattening. By R. Warington, F.R.S.	35
Concerning Cotswold Character. O. S. ...	41
The Nursing of Veterinary Patients. H. A. Woodruff	43
The Nature-Study Exhibition. J. C. Medd ...	48
The New Movement in Ireland. Part I.: Self-Help. Bruce Swanwick, M.R.A.C.	51
The Rubber-Cored Golf Ball. G. T. L.... ...	57
Jottings on Bee-Keeping. E. Powell-King	59
Literary and Debating Society's Concert ...	62
The R.A.C. Literary and Debating Society's Dramatic Entertainment	62
R.A.C. Steeplechase ...	63
The Royal Agricultural College Club	63
Old Students	63
Diploma Examination ...	64
Scholarships	64
Brown Entrance Scholarship	64
"Miller" Fund and Trust	64
Chlorine in Rain Water. E. K.	64
Football	64
Golf	66
Billiards	66

ALL RIGHTS RESERVED.

CIRENCESTER: ALFRED T. HARMER, MARKET PLACE.

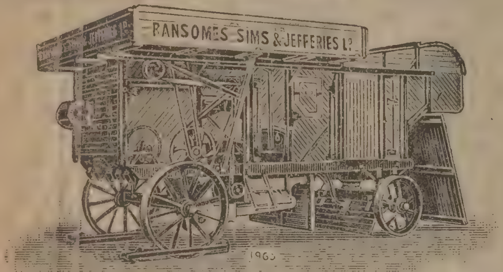
RANSOMES, SIMS & JEFFERIES, LD.



MANUFACTURE THE BEST

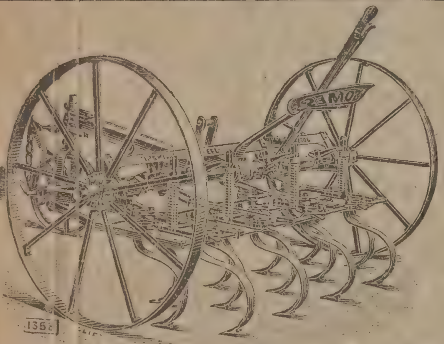
TRACTION ENGINES,
PORTABLE ENGINES,
VERTICAL ENGINES,
HORIZONTAL ENGINES AND BOILERS.

Excellent designs, first-class materials and workmanship; ample strength in all working parts; large bearings and cylinders; ample steam space.



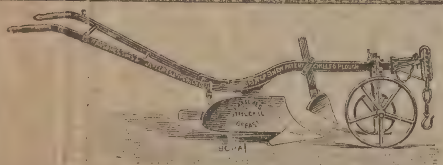
STEAM THRASHING MACHINES,
FINISHING THRASHERS,
SINGLE-BLAST THRASHERS.

R. S. & J. have supplied Thrashing Machines to HER MAJESTY THE QUEEN and H.R.H. THE PRINCE OF WALES.



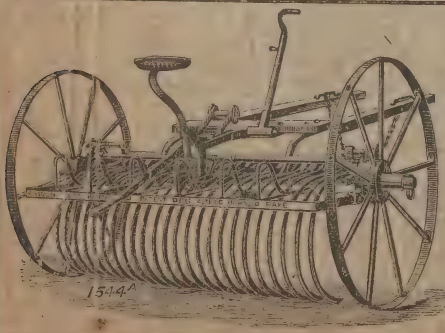
"THE IPSWICH" STEEL CULTIVATOR.

THE STRONGEST, BEST, AND MOST PERFECT MACHINE IN THE MARKET. THE SPRING OF THE TEETH KEEPS EVERYTHING ALIVE. CAN BE FITTED FOR TWO OR THREE HORSES.



IRON AND WOOD PLOUGHS,
2 AND 3 FURROW PLOUGHS,
CHILLED DIGGING PLOUGHS.

R., S. & J., Ld., have been manufacturers of Ploughs for nearly a century, and the Chilled Plough Share was invented by Robert Ransome in 1803.



MANUAL DELIVERY RAKES,
SELF ACTING RAKES,
HAYMAKERS, etc.

R., S. & J., Ld., won the First Prize, £20, at the Manchester Meeting of the R.A.S.E. with their "Star" Horse Rake, and have since sold nearly 40,000 Rakes.

◆

FULL ILLUSTRATED CATALOGUES
FREE BY POST ON APPLICATION.

◆

ORWELL WORKS, IPSWICH.

hay or straw are employed. In the case of meadow hay, oat straw, and wheat straw, we have the actual determinations of their production value resulting from Kellner's experiments with fattening oxen.

Kellner has shown that if we calculate the production value of meadow hay and oat straw by giving to each unit of digestible albuminoids, fat, and soluble carbohydrates, the calorific value ascertained by himself when supplying these to fattening animals, we obtain a value for the hay and oat straw very closely agreeing with that found by actual experiment with the oxen. The mere omission of the fibre from the reckoning thus suffices to make calculation agree with experiment. It appears, therefore, that in these foods the energy gained by the animal from the digested fibre is pretty exactly balanced by the energy consumed by the animal for fibre digestion. When, however, the same process of calculation is applied to wheat straw the calculated value is much above the actual value even when the fibre is omitted from the reckoning. In this case the energy consumed in digesting the fibre is apparently considerably greater than the energy furnished by the product of the digestion, and the effect of the fibre is a negative quantity.

As the matter is of considerable importance I give below the figures just referred to. One gram of albuminoids is taken at a production value of 2·1 Calories; soluble carbohydrates at 2·2 Calories; fat at 4·9 Calories; and digested fibre at 2·3 Calories.

PERCENTAGE COMPOSITION OF DIGESTIBLE ORGANIC MATTER.

	Hay V.	Hay VI.	Oat Straw.	Wheat Straw.
Albuminoids	8·9	9·8	2·9	none
Fat	2·3	1·9	4·0	0·5
Soluble Carbohydrates ...	54·5	55·5	48·6	40·9
Fibre	34·3	32·8	44·5	58·6

PRODUCTION VALUE OF 1 GRAM EXPRESSED IN CALORIES.

	Hay V.	Hay VI.	Oat Straw.	Wheat Straw.
When Fibre included... ...	2·29	2·27	2·35	2·27
,, ,, excluded ...	1·50	1·52	1·33	0·92
Actually found by experiment	1·43	1·60	1·41	0·59

It appears, therefore, that with fibre in the condition in which it occurs in average meadow hay or good oat straw, the mere omission of the fibre, and the calculation of the remaining digestible constituents of the food at their calorific value for animal production, suffices to furnish a value closely agreeing with that shown when the food is given to a fattening ox. This mode of calculation may then be provisionally adopted with excellent results; it will enable us to ascertain far more nearly than before the true values of foods for fattening purposes. It will apparently supply results very nearly accurate for a large class of foods, though it will furnish too high a result if applied to wheat straw, and probably too low a result when the fibre is in the soft condition met with in the turnip and some other foods.

Kellner's figures can of course be only accurately employed when foods are supplied to oxen, the animals with which he experimented, but they are probably generally true in the case of other ruminant animals. It is, however, most desirable that similar investigations should be made on sheep. The nutrition of sheep both for maintenance and fattening is in a sadly obscure condition, and is likely to remain so, as the fattening of sheep is not of general importance to a continental farmer, and is thus not likely to be made the subject of a German investigation. In the United Kingdom there is little hope of such an investigation being carried out, as at present there is, I believe, not a single respiration chamber in existence here.

The fibre which has been so much in question in this discussion is, as all students of agricultural chemistry know, a purely conventional substance, the product of a special method of analysis. If German results are to be used for calculating the value of foods, the German method must be strictly followed in the determination of fibre, the acid and alkali must be of the prescribed strength, and the digestion carried on for the prescribed time, and at the prescribed temperature. Unfortunately the English agricultural analyst is a law unto himself, and great variations in the determination of fibre are in use. It must always be recollected that Kellner's results, and the reasoning from them, apply only to fibre determined strictly according to the German method.

A few words as to present continental usage will not be out of place. Wolff, some years ago, was led to leave out the fibre in reckoning the value of foods for the production of work by the horse; he concluded from a comparison of the effect of various diets that fibre was useless for the production of external work, but he failed to see that the reason of this was the labour consumed in its digestion. In the current version of Wolff's tables of feeding rations edited by Lehmann, one-half of the digestible fibre is reckoned as available for use by the animal. The value given to fibre is thus exactly midway beween the full value belonging to fibre when given as a maintenance diet, and its complete worthlessness when used for the production of animal increase or for labour. The total nutritive value of a food in the Wolff-Lehmann tables is reckoned by multiplying the digestible fat by 2·4, and adding to the product the digestible albuminoids and carbohydrates, plus half the digestible fibre. When the money value of the food is in question, the albuminoids are taken at three times the value of the carbohydrates; this is a very questionable proceeding, it apparently aims at including the manure value of the food.

The practical value of the recent investigations of Kellner and Zuntz is extremely great; only a slight idea of the work done has been given in the present paper. The cause of the inferiority of fibrous foods is now plainly indicated. This inferiority does not exist when they are used for maintenance diets, it is shown when production is required, and effectually prevents their ranking as effective fattening or labour producing foods. Another stage has thus been reached in the development of the science of feeding, and another part of practical work can henceforth be carried out with the certainty and effectiveness which only comes from true knowledge.

CONCERNING COTTESWOLD CHARACTER.

It is said that the aspect of the country they live in has subtle but distinct influence on the characteristics of all dwellers on the hills. That this is not equally true of those living in the vales may be partially traced to the fact that there, generally, lie the great towns, which attract to their midst people from all parts; and that wherever large numbers are herded together in small space, the constant friction "knocks the corners off them"—those quaint corners, true causes of individuality either in rooms or folk.

There is nothing more characteristic in Cotteswold scenery than its beautiful old grey-stone walls, and even as these are clothed in beauty the whole year round with faithful flowers and kindly creeping plants—from the yellow stonecrop, green-bronze ivy, and dainty saxifrage of spring; snap-dragon, and amethyst and purple of scabious, and thistle, and blood-red poppy in summer; to the scarlet glory of dogwood, and bramble, and pearly whiteness of the clematis—"flower of the Assumption"—that flower which old Gerard tenderly describes as "decking and adorning waies and hedges where people travel, and thereupon I have named it 'Traveller's Joye'; this again changing in late autumn to the fairy floss-silk cobwebs of 'old man's beard'"—so, in the kindly Cotteswold folk, the seeing eye will discover all manner of beauties and quaintnesses: their friendliness, their wonderful long memories, and, most marked characteristic of all, their amused intolerance of modes of thought and ways of living, which they are neither able, nor particularly desire, to understand.

That curious, half-ironical sense of humour which finds its vent in a species of caustic wit is trying to the uninitiated, who are apt to stigmatise such sallies as grumbling. More often, however, it arises from a suspicion that patronage is intended, and the Cotteswold people resent patronage, though they are in many respects the most feudal and conservative of the agricultural classes.

Among the benefactions pertaining to a certain Almshouse inhabited by a number of old goodies (will there be such a creature as a "goody" left at the end of this century, I wonder?) were warm red cloaks, comfortable to behold, and most becoming to their wearers, the receipt of which, however, depended upon the number of week-day services attended at the parish church. A visitor of artistic tastes having seen and admired one of these good ladies at evensong, ventured afterwards to compliment her upon her beautiful cloak, whereon she muttered "The Lard knows as I've yarned un, any 'ow, and I aint sure now as I got the best of the bargin."

They are suspicious of new things, these old-fashioned country folk, above all of new articles of food. In days when cottage gardens had by no means attained to the varied contents so pleasantly common now-a-days, an enterprising squire tried hard to induce certain of his cottagers to grow rhubarb as being a most wholesome and useful vegetable. He presented a bunch to one of his oldest labourers, and meeting him next day enquired how he liked it.

"Thank 'ee kindly, zur, us 'ad it for dinner as you said."

"Well, and what did you think of it, it's good, eh ?"

"Thank 'ee, zur, my old 'oman she did cook un, sure enough."

"Yes, yes, but how did you like it ?"

"Well, zur, I daresay as the quality do like it."

"Yes, but how did *you* like it ? I particularly want to know."

"Well, zur, since you astes me, I can't say as we were much set up wi' un."

"I'm sorry for that, up at the house we think it uncommonly good eating."

"Ah, à daresay as you does, zur, but 'taint for the likes of we ; my old 'oman she biled un up wi' a bit o' beäcon, too."

Pigmeat they know well, with beef they have a bowing acquaintance, say, at Christmas time, and "scrag ends" of necks of mutton *may* occasionally appear "of a Sunday," but soups they hold in high scorn.

"It be deceitful stuff, that's what I do call it," said one old gaffer apropos of benevolent libations sent by a charitable vicaress, "you goes on 'avin un, an' eats un till you nearly bustses, an' 'alf a hour a'terwards your inside be as cold as a church."

Very tenacious of their privileges, *they* call them "rights," are certain "oldest inhabitants." I have known vicar, vicaress, and the vicarage young ladies all go in dread of the criticisms of a quondam parish clerk, crippled with rheumatism, cranky in temper, and mistrustful of innovation, as an unbroken colt of a threshing machine.

Because he had been parish clerk for "nigh upon fifty year," he considered that when he retired from that position he still should have a voice—a "shout" his much-tried vicar called it—in all parish matters.

He disapproved of decorations as savouring of popery, and the first time the new vicar's family attempted to adorn the church for a harvest thanksgiving, he came down and ordered, yes, actually ordered them "to take that there garden produce off the consecrated ground. A church baint a market, an' I won't 'ave none of them vegetables in my church I tells 'ee." It was only when the vicar, backed up by the chief churchwarden, appeared to expostulate, that he ceased to shout "take it off the consecrated ground."

One Sunday, service having well begun before "old Nathan'l" condescended to put in an appearance, some stranger happened to occupy the veteran's usual seat. He was half-way up the aisle before he noticed it, but when he did so he stopped short, gave a snort of indignation, glared at the congregation, and regardless of the fact that the first lesson was in progress, exclaimed loudly "full 'ouse, full 'ouse, good marnin !" and hobbled out again.

He really was a terror, that old man; by sheer force of character and the sharpest tongue in the world he kept the whole village in subjection, and this in spite (or more probably because) of his almost incredible poverty, while he grumbled continually at the quality of the gifts that kept body and soul together.

When the young squire came of age, there was a dance on the lawn in honour of that event, and of course old Nathan'l went to inspect the company through a chink in the tent. "It do be a very 'ot way o' coortin," he remarked disapprovingly to a neighbour, "a skippin' around wi' them maids. W'en I did dance, I did stand up proper by myself to do un, and as for coortin' . . . what proper 'old can 'ee get with she a bouncin' about like a dumplin' in a pot? I don't 'old with them new fanglements, that I do'ant."

But a disapproving attitude towards life in general is by no means characteristic of folks in the dear Cotteswold country. Live with them for but ever so short a time and you will find that they are eager to discover your own good qualities and to belaud them; and should any trouble befall you, their sympathy is as genuine and spontaneous as it is sometimes naively expressed. They are much given to seek the silver lining beneath the cloud, as witness the custodian of a certain graveyard, who, finding a disconsolate widow weeping beside her husband's grave, hastened to point out that it wouldn't cost her "more'n two pound ten" to be buried there herself, "no, not if it was to-morrow as you was carried in."

O. S.

THE NURSING OF VETERINARY PATIENTS.

All engaged in medical or surgical practice, whether for the benefit of the human or other species, know how valuable is the aid of a good skilled nurse. Especially, I think, do veterinary surgeons appreciate the great assistance they get when their own endeavours for the welfare of the patient are backed up by the ready help of the owner or attendant, and this, no doubt, because the nursing of sick animals is as a rule neither attempted nor understood.

The aim of all who endeavour to treat disease should be, in the words of the old precept, "*Curare cito tute et jucunde*," and to achieve this the practitioner knows that more importance is often to be attached to the careful carrying out of his instructions as to nursing the animal than to the medicine given.

The importance of nursing, then, is my apology if one be needed for writing this article. It is written from the point of view of the veterinary surgeon who is anxious to secure the services of a capable, observant nurse for his patient, and who knows how much this may mean in a crisis.

In the first place such a nurse would carefully observe and record all the history and symptoms of the onset of the disease, and it is impossible to exaggerate the importance of this in the case of patients who can themselves afford no information; in fact a correct diagnosis in many cases is only possible in the early stages of disease if the history and premonitory symptoms can be obtained.

In the case of internal diseases, the temperature, number and character of the respirations, the appetite, desire for water; signs of pain, such as looking round at the flanks, kicking the belly, patchy sweating and groaning; also the time when unusual behaviour was first noticed; these are all useful guides to the professional attendant.

In surgical cases, too, such as lameness, the onset and duration should be noted; also the style of action, whether going on the heels or toes, abduction or rotation of the limb, improvement or the reverse on exercise, also any swelling or heat or the evidence of local pain, and the wearing of the shoes. The noting of these points will allow of answers being given to most of the questions likely to be asked. And here it must be mentioned that the application of liniments and embrocations to a lame leg before calling in a veterinary surgeon is generally a useless and often a harmful proceeding. As a rule the first thing to be done when the surgeon comes is to wash off the irritant and greasy preparation used, and apply cold water for a week to allow of the limb being manipulated sufficiently for a diagnosis to be made. So much then for observation and note taking before the professional man arrives. There is, however, something else which may well be done even at the very first, namely, making the patient as comfortable as possible.

In almost all internal diseases a good roomy, well drained and ventilated loose box is the right place for a horse, and if completely isolated so much the better. The skill and ingenuity of the nurse is often tested in finding the most suitable place of which to make an isolation box, and more especially in adapting the local conditions and resources to the requirements of the animal. All this can frequently be done better by the owner or attendant, who knows what is wanted and what is obtainable, than by the veterinary surgeon, who is a stranger to the place. What, then, are the requirements in a sick box? The box must be roomy, if possible 12 ft. × 16 ft. or 16 ft. square; light, for sunlight is a powerful germicide; well ventilated, for the exhalation from the lungs contain more carbon dioxide than in health, and so renders more air impure, in addition to which the excretions from the skin, kidneys, and intestines all tend to make foul the air; well drained, so as to get rid of urine as soon as possible; and well paved with some material not too slippery, for sick horses getting up and lying down are very liable to slip about and may fall; lastly, the box should be isolated to avoid all risk of infection. Of course such accommodation for a patient is comparatively rare, too rare, but it is for the nurse to get the best obtainable, and it may be well to give a few hints to guide one in making a selection in special cases. In diseases of the respiratory apparatus, fresh air is an absolute essential, and therefore facilities for good ventilation, or rather for the inflow of plentiful supplies of fresh air, must be at hand in any box selected. In colic or abdominal diseases, the box should be large and bare of all furniture against which the animal would be likely to roll or fall. The horse should be allowed to walk about or roll at will and the litter should be raked high up round the sides and corners. In places where there are two suitable boxes the aspect should be considered: in midsummer, the shady side should be selected, as horses dislike any glare or great heat in a stable; in winter, the south side. In cases of lameness it may be advisable to keep the animal quiet, when a stall or small box will do; or in any case where slings are required to support the animal, a box must be selected where there is a cross-beam or where one can be fixed to carry the sling chains. For parturition, even in normal cases, a large box is always advisable, well littered up round the sides, and with some means of lighting it up at night if possible. Lastly, it is always advisable to freshly lime-wash the walls of a box to be used for a sick animal, and it may often be wise to sprinkle some good deodorant and disinfecting powder, such as "Sanitas," on the floor before putting down the bedding.

As to the bedding itself, as a general rule there is nothing better than clean wheat straw, but peat moss is good for colic cases, as the animal requires a deep soft bed to roll in; in lung diseases peat moss is unadvisable as the box is always dusty, and no doubt much dust is inhaled. In some cases the animal requires short-cut straw, for long straw gets round the legs and may throw a horse down; also in a foaling box, the foal requires the straw to be short-cut.

The patient now being in comfortable quarters soon requires to be fed, and the question is what food will be best. Very frequently an owner in asking this question is informed that the horse may have anything he will eat, and many people have the idea that the first, last, and only thing with which to try a sick horse is a bran mash. A bran mash is generally good, for it is laxative to the intestines and yet a fairly good nutritive, but horses soon tire of it, in fact sick horses soon tire of any one kind of food. What else then may be substituted? When obtainable green fodder, tares, rye, trifolium, &c., should always form part of a sick horse's diet, and many horses will eat grass in preference to anything else. Steamed linseed is excellent for sick horses, and freshly made and poured over a little chopped hay and corn, is readily taken, when the corn alone would be refused. Mixing the food, pouring boiling water over it, and allowing it to stand covered till cold before offering it to the horse, may be tried. Again, a bran mash is often readily eaten if a handful of maize meal or bean meal is added to it, or small quantities of barley or maize may be substituted for oats with success. Steamed hay, or "hay tea," an infusion got by pouring boiling water over hay, is nutritive and varies the diet. Carrots cleaned and sliced, and even such luxuries as bread and apples, are all useful in persuading a sick animal to feed. A piece of rock salt is a useful appetiser and assists digestion.

As with a sick man, the sight of a large quantity of food almost always upsets an animal with a poor appetite, and small quantities offered at frequent intervals are much more likely to be appreciated. Then, too, a horse greatly values company, and will often feed from an owner's hand when he will not look at the manger.

And now, after considering the inner man, or rather horse, the exterior requires some attention. The grooming of sick horses is often neglected, and the excuse offered is that the horse is doing no work. At the same time it must be remembered grooming is essential for the normal action of the skin, and as this is one of the great excretory channels its healthy action must be promoted by every possible means. Especially is this the case when the diseased condition affects the kidneys or, to a less extent, the intestines, for if these organs are prevented from carrying on their normal functions the skin must do more work to compensate for their lessened action. Again, in many diseases sweating occurs either as a sympton of the disease, or it may be produced by the medicines given and intended to lower the animal's temperature. In whatever way caused, the sweat dries on the skin, and grooming is necessary both in order to remove this material and also to get rid of the dirty appearance. Again the sensation of cold or heat experienced by the animal largely depends on the state of the circulation in the skin vessels, and as grooming stimulates the cutaneous circulation it warms the horse and gets rid of the harsh upstanding appearance of the hair, which shows that the horse is cold and often correspondingly miserable. Thus, then, grooming is necessary both for health and comfort, and though there are times when it would be sheer cruelty to bustle about a very sick animal, yet generally the cruelty lies in the neglect of this procedure. As a rule it is best to avoid the use of the dandy brush and curry comb on sick horses, a soft body brush, a wisp, and a rubber being all that is required, and in any case the noisy, boisterous, shouting groom should be kept at a safe distance from a sick horse.

With regard to clothing, the time of year makes a great deal of difference, and also the customary amount of clothing, if any, worn in health ; but at any rate warmth retained by rugs is better than warmth kept up by closed ventilators. Flannel is the best material for rugs or sheets, except in hot weather, when a thinner cotton sheet or one made of porous cellular material is best, preventing chill and keeping off flies, which so annoy a sick animal. The rugs must be changed and hung out to dry and get quite sweet and clean at least once a day. Bandages are generally useful and in the majority of cases are required to keep the extremities of the limbs warm. For this purpose they should be of flannel and must be loosely put on, for if tight instead of assisting they impede the circulation, and the legs get quite cold. Of course these stable bandages should go from below the knee and hock right down to the foot. In surgical cases, the kind of bandages will vary with the disease, viz., for painful recent inflammation, hot water bandages fairly loose ; to support sprains after the acute pain has passed off, tightly applied cold water bandages, usually of calico or cotton. The "filled legs" or swollen condition of the legs so often noticed in sick horses is simply due to congestion of the lymphatics due to impaired circulation, in other words to a flooding of the vessels because of the want of force in the pump, in this case, the heart. To prevent this the loose flannel bandages first mentioned should be used, and in addition exercise, if not otherwise disallowed, will materially help. But of this subject I must now say a word or two.

Exercise, properly advised, is often of the utmost value to a sick animal; of course its greatest use is during convalescence, but in very many diseases which are more or less local, to lead a horse out, even if only a few yards, especially in the sunshine, will cause a marked improvement in his condition and appearance. Especially is this so where there is a tendency to lymphatic congestion of the extremities and dependent parts, so commonly seen in influenza and purpura hæmorrhagica. Of course in both these diseases there are times when exercise would be extremely inadvisable and in all cases the advice of the professional attendant should be asked, but my endeavour is to point out that in suitable cases and circumstances exercise may be a potent factor in quickening recovery. In cases of lameness the amount and duration of exercise advisable varies greatly. In acutely painful cases, or where much injury to tissue, bone, or muscle has occurred, perfect quiet is generally necessary for repair and recovery, but in cases of nervous origin, such as partial paralysis, or in lymphangitis (otherwise known as "weed" or "Monday morning disease," which though a systemic disorder is most apparent by reason of the lameness and swelling of the limb) exercise at first gentle but progressive is very useful.

One very important duty of a nurse is the regular and skilful administration of the medicines prescribed for the patient. Unfortunately medicine is often given to a horse only after a struggle of such a nature as to more than counteract any beneficial action the drug might have had. Drenching almost always annoys and excites a sick horse, although some men can do it with the exertion of the least possible force, and of course in some cases drenching is necessary no matter what the difficulty. The giving of a ball by an expert man is a quick and very convenient method of administering medicine, and causes little or no distress to the patient, but some horses after a few doses of physic, especially if they have ever tasted the aloes, are very difficult to ball, and then, too, the expert at giving a ball is not made without practice. If, then, the animal resents drenching, and if there is a difficulty about balling the horse (a difficulty quite common, but about which the V.S. is often deceived by a would-be-thought-clever person) how shall the medicine be given? This depends on circumstances, especially the disease and drug to be used. Many powders neither irritant nor nauseous can be given either in food or in the drinking water, or the agents may be made up with treacle into a kind of paste, an electuary, and this may be placed upon the tongue or molar teeth by means of a wooden spatula. In the case of many alkaloidal salts and some other agents a hypodermic injection is an excellent way of administration, or in a few cases direct introduction into the veins may be advisable, but both these methods if applicable are likely to be carried out by the professional man himself. The important matter is, however, that the administration of medicine should cause as little distress to the patient as possible, and kindness and gentleness should be unfailing on the part of the nurse.

Some remarks have already been made as to the necessity of isolation in cases of contagious or infectious diseases, and under these conditions the attendant should be extremely careful to avoid carrying the contagion to healthy animals. As far as possible his duties should be confined to the hospital boxes, and in all cases the grooming utensils, buckets, halters, and everything used in connection with the patients should be kept solely for their use.

And now my space is exhausted and many important items must perforce be omitted, such as the dressing of wounds, the disinfection of stables, &c., whilst others have only received scanty treatment. The horse has throughout been specialised, but most of the instructions given can be readily adapted to cattle or other animals. My object in writing has been to show that much may be done by a kind but skilled nurse having a love for his patient, and if I have been able to instruct and encourage some to undertake this work for the alleviation of the sufferings of the animals under our care my labour will be amply repaid.

H. A. WOODRUFF.

THE NATURE-STUDY EXHIBITION.

[Held at the Royal Botanic Gardens, Regent's Park, London, July 23 to August 5, 1902.]

Amid the conflict, which seems inseparable from the question of education, it is a relief to find one aspect of it about which there is no difference of opinion. "We are all coming to be agreed," wrote Matthew Arnold a generation ago, "that an entire ignorance of the system of nature is as gross a defect as not to know that there was such a person as Charles the First." The conviction is now universal that education must be brought into closer contact with the realities of life, and that it should include some practical knowledge of the world about us. Excellent examples of the type of instruction desired may be seen in many schools, notably at the Bootham School, York, but these instances are isolated and comparatively unknown. Hitherto there has been no general agreement as to what is practicable and expedient in teaching nature-knowledge. It was felt, therefore, that the time had arrived for collating individual experience and providing a sort of central object-lesson in the best methods of instruction. Of this feeling the Exhibition was the outcome. While seeking to promote certain fundamental changes in the popular conception of education, its organisers were careful to explain that they intended in no way to disparage literary culture. As the Duke of Devonshire observed :—

> "I conceive that the idea which underlies this movement and this new departure is that while we know there is much, indeed a vast amount, to be learned from books, and while it would be foolish, I may say idiotic, on our part to neglect those stores of knowledge which have been accumulated and

> handed down to us by those who have gone before, yet at the same time there is also much to be learned not from books but from the facts of nature itself. While the study of books may too often be only an exercise for the faculty of memory and may leave almost untouched the other faculties of the human mind, on the other hand the study of the facts of nature, the intelligent observation and study of the facts of nature, is a mental discipline which cannot fail to develop those powers of the mind which it is the object of all true education to discover, to cultivate, and to strengthen."

The enthusiasm with which the project was received exceeded the most sanguine expectations. No visitor to the Exhibition last July could fail to be struck with the great variety of the exhibits, and the wide range which they covered. County Councils, University, Agricultural and Training Colleges, Secondary and Primary Schools were fully represented, as were also Canada and the United States. The very large space placed at the disposal of the committee by the Royal Botanic Society proved quite inadequate to the proper display of all the exhibits. Some of the material sent could not, perhaps, be strictly classed as nature-study, but this was inevitable at a first experiment, and testified at any rate to the general desire to co-operate in the undertaking. In regard to the Agricultural Colleges, with which the readers of this *Gazette* are more directly concerned, it may be mentioned that Downton sent twenty-three of the well-known coloured pictures of insects by the late Miss Eleanor Ormerod: the Agricultural Department of the Yorkshire College showed the original Field Maps prepared by Mr. R. and Mr. W. G. Smith for the Botanical Surveys of Scotland and Yorkshire: Wye provided some experiments suitable for a nature-knowledge course dealing with plant-life, and also apparatus, all of which could be constructed out of the most ordinary materials without any special skill in handicraft: the large diagram from the Harper Adams College illustrating certain fundamental facts in plant and animal physiology was extremely ingenious but a little obscure to the lay mind: the Durham College of Science had some good specimens of timber attacked by wood-destroying fungi, cankers, &c.: Holmes Chapel dealt with plant diseases, and Swanley with collections illustrating the dispersion of seeds and fruits: Lady Warwick's School at Bigods, Essex, sent some very useful simple apparatus for illustrating phenomena of plant growth. Probably the bacteriological collection from the West of Scotland Agricultural College was the most intrinsically valuable exhibit in this section, although it went somewhat beyond the scope of the Exhibition. It will thus be seen that the above institutions furnished an excellent opportunity for studying different lines of work. Any enumeration or description of what is being done by the hundreds of other exhibitors would obviously be impossible here. It must suffice to say that amongst the secondary schools, Eton, Haileybury, Marlborough, Cheltenham, and St. Paul's (London) were conspicuous.

It is not easy to summarise the conclusions to be drawn from the exhibition. Of the extreme benefit to be derived by pupils of every age and rank from the study of nature, and of its value as the basis for lessons in reading, composition, arithmetic, drawing, painting, modelling, and manual instruction, quite apart from its scientific importance, there was no doubt. But in regard to method the eminent specialists, who addressed the various conferences, expressed very divergent views. This may not have been altogether a disadvantage. Any attempt to stereotype the course to be followed, or to confine nature-study within certain prescribed limits would be fatal. Its vitality would be gone. Teachers must be free to devise their own schemes in accordance with their circumstances and environment. It is really of little consequence whether botany, entomology, zoology, or geology supply the subject matter, provided the teacher understands what he is talking about, and is not wholly, or indeed mainly, dependent upon text books. Huxley repeatedly said that if scientific education were to be dealt with as mere book work, instead of being based upon actual observation and familiarity with facts, it would be better to leave it alone, and we know how much the teaching of botany has suffered in the past from this defect. Much will of course depend upon what is aimed at. In primary and secondary schools this is chiefly to utilise nature-study effectually as an instrument of general education, affording at the same time an introduction to and preparation for science as such. Care must be taken, however, not to exaggerate its importance: it is invaluable as a handmaid to supplement and illustrate literary lessons, but it cannot supplant them. Nor must it be allowed to degenerate into a fad. Emphatic warning, too, is needed against the mischievous and futile habit of "collecting" for the sake of collecting. In agricultural colleges the work is necessarily more technical and utilitarian in its objects. While it is perfectly true that the farmer can only be made by and through farming, still the greater his knowledge of the processes of nature, and the more trained his powers of observation, the greater the likelihood of his success.

As Mr. Choate, the American Ambassador, prophesied would be the case, the effect of the exhibition has been felt in many lands. The Belgian Government specially commissioned its Agricultural Inspector, M. Paul de Vuyst, to visit it, and letters asking for information and advice have already been received from such distant countries as Hungary, India, and Japan. So far as England is concerned, there is every reason to hope that a definite advance will be made towards the improvement of village schools, and this is by no means the least important of the results to be looked for. No feature in the rural districts to-day is more deplorable than the scarcity of men capable of engaging in the more skilled branches of farm work, or the extraordinary lack of *intelligence* in the average labourer. The "handy" man has become almost as extinct as the Dodo, and this is due in no slight degree to the fact that for the past thirty years the village school has tended in every way to divorce its scholars from rural pursuits and surroundings. It has been well said that man has a great deal of curiosity but very bad eyes: the first business then of nature-study is to teach the child to open its eyes and how to use them. Its value consists not so much in imparting a particular kind of information, as in promoting an attitude of observational alertness and of inquiry into the familiar facts in garden and field. The awakening of intelligence will certainly follow, and with it the ability to earn higher wages and to be freed from the monotony of a life devoid of personal interest. During the last two or three months several local exhibitions and conferences have been held, which are gratifying evidence of a genuine effort to turn the London exhibition to profitable account.

A full report of the exhibition and conference addresses will shortly be published by Messrs. Blackie and Son.

J. C. MEDD.

THE NEW MOVEMENT IN IRELAND.

PART I.—SELF-HELP.

Those who desire to stimulate the British agriculturist to seek salvation for his industry along the lines of greater combination in the work of production and sale, generally direct his attention to the example afforded by Denmark. That example is certainly a remarkable one, but it is not necessary to go so far afield in order to find ideas and methods worthy of our study and attention.

For some twelve or thirteen years a small but influential body of Irishmen have been trying to infuse into the agricultural portion of the population a spirit of self-reliance, and to teach them how by combination and mutual effort they might improve the economic and social condition of the country. The first practical outcome of the movement was the foundation of the Irish Agricultural Organisation Society on the initiative of the Right Hon. Sir Horace Plunkett, its first president, to whose genius it owes its extraordinary success.

The Irish Agricultural Organisation Society is a central body whose members are drawn from every shade of political opinion; its aim and object are to promote by friendly counsel and advice the improvement of the commercial and technical methods employed in the agricultural industry, without interfering or taking away any responsibility for the business concerns of the people. "The *modus operandi*," quoting from the Society's report for the year 1899, "is to organise groups of farmers on co-operative principles, and to provide them with some instruction in the technical methods most immediately necessary for the development of their business. Whenever and wherever a branch of the farmers' industry could be more efficiently or more economically conducted in combination than by isolated individuals, then and there they have been ready to organise a society, and explain to it the rules and procedure which must be adopted before the association can work harmoniously and be commercially successful." Such is in brief the origin of the Irish Agricultural Organisation Society, its purpose, and its plan.

That it has been successful admits of no doubt. In 1889 the societies owing their origin to its inspiration numbered one with a membership of fifty; in June, 1901, they numbered 630 with a membership of 65,000 heads of families, and the trade turnover amounted to £1,167,945. Much can be learnt of the general character and trend of the movement from a classification of the various societies under their respective headings, with a statement of the number and membership of each for the last three years.

	31st Dec., 1899.		31st Dec., 1900.		31st Dec., 1901.	
	No.	Members.	No.	Members.	No,	Members.
Dairy Societies ...	160	22,750	171	26,577	196	33,064
Auxiliary Societies	55		65		81	
Agricultural Societies	104	11,596	106	11,961	112	11,695
Banks	61	2,481	76	3,138	101	4,258
Poultry	21	1,837	21	2,569	26	4,769
Home Industries...	17	815	29	1,549	38	2,639
Flax	—	—	2	37	4	103
Miscellaneous ...	4	242	5	242	4	551
Federations† ...	2	131	2	133	2	132
	424	39,852	477	46,206	564*	57,211

* No. of societies in existence June, 1901, 630, with approximate membership of 65,000, shewing an accelerated rate of progress.

† Numbers denoting membership in the case of Federations signify societies not individuals.

DAIRY SOCIETIES.

It will be noticed that more than 50 per cent. of the total membership is composed of members of Dairy Societies: these Dairy Societies are bodies working co-operative creameries owned by the farmers supplying the milk. At the creameries proper, milk is both separated and the cream churned into butter; the auxiliary is a collecting centre where milk is separated only, the cream being sent to the "creamery" to be churned, the separated milk being returned to the farmers. It is insisted that the suppliers of milk shall be shareholders in the Society, which is therefore in the true sense of the word a co-operative undertaking. Members are paid for their contributions on the true and scientific basis of the butter-fat contained. An increasing proportion of creameries use a Pasteurising plant and artificial starters.

The results of payment on a butter-fat basis, of scientific methods of dealing with the raw material, of business-like methods of packing and marketing the finished product, and of energetic measures to ensure that Irish butter gets full credit in the market for its improved quality, by insistance on a more or less universal trade description, have been that the yield per gallon has shown a steady rise, that the superiority of the product is assured, and that the price in the English market has gone up. The increase of one-fifth of an ounce of butter per gallon recorded in 1897 was estimated to be worth on the quantity of milk supplied no less than £11,380, a pure gain to the Irish farmer. The sales of butter for the year 1901 amounted to £803,730.

This truly remarkable development is an eloquent testimony to the adaptability and business capacity of the Irish farmer, but without the guiding hand of an intelligent central body such a result could not have been produced. The general *modus operandi* of the Irish Agricultural Organisation Society has already been described. In the department of Co-operative Dairying, in addition to the work of initiating and organising the societies on a sound basis, the Organisation Society has been compelled to supplement the deficiencies of Irish agricultural and technical education, the State Department which now deals with that work being prior to 1900 non-existent, and such educational agencies as there were being wholly insufficient.

The greatest difficulty was experienced in obtaining trained dairy managers and dairymaids. Failing the existence of proper centres for the training of dairy experts, the Irish Agricultural Organisation Society determined as the next best step to provide the societies with first-rate expert advice. A regular system of inspection was instituted, the inspectors' duties were to give practical and scientific advice and instruction on the spot when required, and to write a report covering every conceivable question relating to the particular dairy under inspection ; the building, machinery, drainage, and sanitation generally, the books and accounts, and the methods employed by the staff in conducting their business. This report is sent to the central office, when it is compared with similar reports on dairies similarly circumstanced, and a letter of instruction is sent by the secretary to the chairman of the society pointing out defects and suggesting remedies. In addition to this method of imparting instruction, the Irish Agricultural Organisation Society prints and circulates numerous leaflets on subjects connected with the dairy industry. Plans and specifications complete, with bills of quantities, such as are required for the erection of creameries, are issued at a nominal charge.

AGRICULTURAL SOCIETIES.

Numerically speaking, the Agricultural Societies stand next in importance to Creameries. The functions they perform may be divided as follows :—

1. The improvement of live-stock by the purchase of pedigree bulls, sheep, pigs, and even stallions for the joint use of members.
2. The acquisition of the more expensive agricultural machinery, such as thrashing machines, self-binders, &c., for a similar purpose.
3. A considerable business in agricultural requirements, the joint credit of the society enabling them to borrow money on reasonable terms, and thus to effect purchases on a cash basis at a considerable reduction in price.
4. The sale of produce, which has made some progress, especially in the case of bacon pigs. A consignment is collected, ticketed and sent to the factory, each consignee receiving the price of his lot on the basis of carcase-weight.
5. A no less important work, undertaken by the help and with the

co-operation of the Agricultural Societies, has been the demonstration, by means of experimental plots, of various facts of scientific and practical interest. Thus, in 1897, eight societies undertook to demonstrate by experiments on barley, green crops, and grass of the effects of different manures, kinds of seed, and times of sowing.

AGRICULTURAL CREDIT BANKS.

Perhaps the most interesting development of the movement has been the establishment of Co-operation Credit Banks on the Raiffeisen principle.

In order to appreciate the benefits which these banks confer, it must be borne in mind that Ireland is largely a country of small occupiers, whose entire capital is in the form of live and dead stock, and with whom ready money is usually scarce. Joint-stock banks have hitherto not looked upon the Irish farmer as a class affording bankable security. The rates charged have been exorbitant, the periods for which loans can be made too short, necessitating renewals, and no facilities have been afforded for repayment by instalments. In times of temporary necessity, therefore, the Irish farmer has no alternative but the 'gombeen man,' who is unhappily proverbial as a national institution. An instance is quoted where a loan of £3 from the local representative of this class had cost the borrower as much as £8 in as many years.

A system, therefore, which places at the command of the Irish farmer small sums at moderate interest for profitable investment in his industry, either in the way of the acquisition of productive seed, stock, or useful implements, or in the way of enabling him to defer realisation till it can be most profitably effected, is one which confers upon him an inestimable benefit. Not only in the increase in the number and membership of the banking Societies, but in the record of their transactions is there reason for confidence in their future success, and in the honesty and business capacity of the people on which that success depends, and which co-operative institutions are doing more than anything else to foster.

In the year 1897, when a more detailed report was issued, there were no bad debts; punctuality of repayment was the rule, and out of 536 loans granted by one society only 12 members were one week late in repayment.

Why the Agricultural Bank has been able to undertake successfully what the financially far stronger Banking Company has not thought it worth while to attempt, is due to their character and constitution. The Agricultural Bank is essentially an association of neighbours, and is based on the unlimited liability of every member. Every loan is submitted to the careful scrutiny of a committee who are acquainted with the personal character of the borrower, and who, in the case of default or inability to repay, will be called upon to bear their share of the loss. The object of the loan must be stated before being granted, its application will be watched, if misapplied it may be recalled or a penalty inflicted. Losses, therefore, in the form of bad debts are rare, at the same time expenses are few, as no salaries are paid. A bank with a good name has no difficulty in borrowing money. In some districts Joint-stock Banks are ready to lend at 4 per cent. The Department of Agriculture and the Congested Districts Board make a practice of lending the Banking Societies sums of £50—£100 at 3 per cent. to form a nucleus.

The interest charged on loans varies from 5 per cent. to 7 per cent., which is a maximum. The usual rate is 5 per cent., or 1d. per £1 per month. The difference between interest charged on capital borrowed and on loans issued is nearly all profit. By the rules all profit must be carried to a reserve fund, which is in no case allowed to be distributed in the form of bonus or otherwise, but must be held to meet emergencies, or in the event of dissolution be devoted to some public purpose. There is no temptation therefore for a Banking Society to degenerate into a mere business concern run for profit.

It is to the initiative and guidance of the Irish Agricultural Organisation Society that the system of co-operative Banks owes its origin and its success. It has sent organisers to start banks and explain the principles of business and account keeping, it has drawn up model rules for the constitution of societies and the conduct of business, it may nominate members to act in lieu of a council of control to examine the accounts and to check the working of the committees.

POULTRY SOCIETIES.

Poultry Societies form a branch of the co-operation movement which has shown a tendency towards rapid increase. By insisting on the freshness and cleanliness of eggs, by adhering to the practice of purchase by weight instead of by number, by substituting regular and punctual collection for the pernicious practice of holding over till a sufficient accumulation has taken place, by improved methods of packing, and by the adoption of a brand which carries with it a guarantee of excellence, the Poultry Societies have done much to redeem the "Irish egg" from the bad name it had acquired.

The result has been a rise in price to as great an extent as 3d. per score. Poultry shows held by the local societies and leaflets distributed by the Irish Agricultural Organisation Society have done much to improve the breed of poultry. Large numbers of Dairy Societies have taken up the poultry business in conjunction with their own. The two branches work admirably together, since the delivery of milk and eggs can be effected simultaneously. It is probable that the largest extension of the poultry business will take place in connection with Dairy Societies.

HOME INDUSTRIES.

The promotion of Home Industries is a branch of the co-operation movement which claims individual notice.

For many years the life blood of Ireland has been drained by the emigration of her young men and women, and the population has shown a steady tendency to decrease. In villages where the "Home Industries" movement has taken root, employment for young women has been created and the wasting process has been in large measure arrested. If any inducement in the form of profitable employment can be found sufficient to keep the young of both sexes at home the gain to the country and to the empire will be great.

Space does not permit of further description of the various miscellaneous branches of the co-operative movement: cottage gardening, bee-keeping, and fruit drying may be mentioned among them. An interesting development, however, not actually part of the movement but growing out of it, is worthy of special mention; namely, the increasing tendency for local societies to become centres for various kinds of social effort.*

The material advantages resulting from these various forms of co-operation among the agricultural population of Ireland have already been indicated; the effect upon the intellectual, ethical, social and political condition of the people is no less important. In the first place, consider the educational value of training associations of small farmers in the joint management of more or less intricate and extensive business undertakings, carried out on the most modern and scientific principles, under the guidance and supervision of a thoroughly competent central organisation. How much such a movement must contribute an interest and stimulus to a rural life whose condition had hitherto been one of ignorance and stagnation. Consider, too, the value of these local societies as centres and channels for the dissemination of knowledge by the newly constituted "Department of Agriculture and Technical Instruction." Where there has been no intellectual stirring of the soil through the agencies of self-help, or as the result of local initiative, the seed of knowledge dispensed by the State must always fall on barren ground. How much the movement must tend, from an ethical point of view, to raise the standard of public and private honesty and straight dealing; from a social point of view to foster a feeling of mutual interest in a common object, and thus politically to traverse the existing lines of cleavage and make for what Ireland has long felt the want of, the solidarity of national life, are themes beyond the scope of this essay.

It remains only to insist on the lesson which the success of the movement has for us, and it may be conveyed in the single word, the watchword of every progressive industry to-day, "*Combine*"!

BRUCE SWANWICK, M.R.A.C.

---

* In connection with a prize given to the society which should do most towards making its district a pleasant place to live in, the six months record of one society may be quoted. In this instance the efforts of the locality took an educational form. Lectures were delivered on such subjects as poultry, horticulture, veterinary science, with magic lantern entertainments after every lecture; attendance at night schools was encouraged by offering prizes. A domestic nursing school for girls, average attendance 44, and a carpentering class for boys, average attendance 20, were successfully inaugurated. Forty demonstration plots for seeds and manures were laid out.

THE RUBBER-CORED GOLF BALL.

The above may seem a somewhat inappropriate title for an article in an Agricultural Gazette ; the connection between golf and agriculture, however, is unfortunately much too obvious to the golfer, at any rate in the early stages of his golfing career ; it is therefore scarcely necessary to apologise for the introduction of the subject in this magazine, particularly at a time when the number of golfing agriculturists is, we believe, greater than at any previous epoch of the R.A.C. Golf Club's existence. A reason for apology might be found in the introduction of views concerning the subject somewhat at variance with those of the greatest golfing authority the College can boast, namely, Mr. J. L. Low, whose achievements, not only in the game but also in the literature of the subject, have for years been a source of pleasure and pride to members of the R.A.C., both past and present.

The case in favour of the rubber-cored ball seems to us to be :—First, that for certain golfers it increases the enjoyment of the game, this being due partly to the increased length of drive obtainable with it, partly to the greater facility with which a hazard requiring a lofting shot may be negotiated, and partly to the fact that the excitement of watching a ball proceeding into the rough is at least trebled owing to the greater cost of the rubber and the equal probability of its loss as compared with the "gutty." The second point in favour of the new balls seems to be, as has been shrewdly pointed out by the Prime Minister, that no standardisation has up to the present existed in golf, and it would be a pity in a game in which absolute freedom has hitherto been permitted to introduce such a radical alteration. If gutta percha be defined as the substance of which golf balls must be composed, we shall find that standard clubs will next be required, as it is *a priori* probable that the increased carry, though not the increased run, may be obtained by introducing the rubber core with a leather or spring steel face in our drivers and other distance clubs, transferring the increased elasticity from the object struck to the instrument with which the stroke is made.

Let us now briefly examine the arguments adduced against these American novelties and see how far they are true and how far relevant. In the first instance we shall look into the attitude adopted by the professionals. The Professional Association has forwarded a minute to headquarters and to the Prestwick Golf Club, on whose links the open championship is to be played for next year, to the effect that the new balls "while admittedly affording pleasure to many players are not conducive to the advancement of golf as a game of skill." Even if the qualifying clause, "upon courses as at present laid out," be added to the above statement, we contend that it is only partially true, if true at all, and that although the American ball carries further not merely off wood but particularly off iron clubs, it is also more difficult to stop, so that no lengthening of present courses would be requisite but merely an increase in the number of bunkers in close proximity to greens, and we may remark that Mr. Low has many times expressed a desire for more bunkers than at present exist quite apart from the type of ball used. Had the word "skill" been replaced by "violence" in the preceding statement of the Professional Association, we should gladly acquiesce, but surely the skill of the game consists largely in accuracy of strength in approach shots, and as errors in strength are magnified by the increased resiliency of these balls, increased errors in distance are produced, whilst we have not heard it contended that it is easier to obtain direction with rubber than with "gutty"; approach shots, then, being rendered more difficult, the skill required is certainly not decreased; moreover, all sliced or hooked shots have their effects accentuated by increased carry, so that it becomes doubtful if the skill required in full shots, viz., the avoidance of the production of all rotation of the ball save underspin, is not more rewarded, or to be more accurate, its lack more punished in the case of the rubber than in the case of the "gutty." The reason for the professional attitude is fairly obvious, for the professionals are at present pecuniarily interested in the gutta percha ball. Further, the professionals have every right to elect that their own championship shall be decided with whatever ball they choose; but what adequate reason can be adduced for their governing the open championship? The professional surely exists for the convenience of the amateur, to teach him the game, to provide him with the necessary implements, to give exhibitions for his delectation; but naturally the man who pays the piper must be allowed to choose the tune, and if the amateur plays for pleasure and admittedly derives greater pleasure from the game when using a rubber-cored ball, then there is no reason why the ball should be ostracised.

Another argument which has been used against these balls is that they have a levelling influence, that is, that they reduce the aggregate of strokes taken by the inferior but not by the better players. Let us admit that on courses as at present laid out the inferior player completes the round in a less number of strokes, so also does the good player, but his round is not reduced by the same number, but merely, as might be expected, by a number which is less in proportion approximately to the former aggregates. The statement, which was at one time freely circulated, that the long drivers can drive no further than formerly seems very doubtful, or why should men like Mr. Edward Blackwell take to the ball, which is generally conceded to be more difficult in the short game. The last objection of importance which has been urged against these balls is that their cost is such as to place them beyond the reach of certain players, for example, amongst professionals, all but those of the first rank; this argument seems fallacious, for although there is a much greater initial cost, which will probably be soon considerably reduced, yet the increased life of the ball makes it a cheaper ball in the end, since we find that these balls may be topped and otherwise maltreated without losing their rotundity, whilst the same punishment administered to the "gutty" would render it quite unfit for further play.

In conclusion, we think that that freedom which is conceded to a player in the choice of his clubs may safely be permitted in the choice of his ball, and that no decadence has as yet resulted in the skill of golfers, whether amateur or professional, by the use of the rubber-cored ball.

G. T. L.

JOTTINGS ON BEE-KEEPING.

"They teach
The art of order to a peopled kingdom."

Believing that bees should be a part of the live stock of every holding, having been asked to contribute to the *Agricultural Students' Gazette* something on a subject connected with farming, and knowing my association with agricultural subjects in general exists more in the past than the present, I offer a few notes on one of the minor industries, which, though not a subject taught at the R.A.C. in 1879, is one that might well have a place in the curriculum, might be represented in the Botanical Garden by some hives, and have a demonstration devoted to it four or five times a session.

We cannot all become bee-masters ; we have not all the ear to be charmed by the bees' droning, nor have all the nerve that can stand with equanimity the fire of their stings ; but to anyone who has the former I would advise when approaching a hive for the first time (and for a good many times afterwards) not only to don a bee-veil, but also to wear a pair of old and thick leather gloves, to which have been sewn the leg of a woollen stocking : protected with these there is every prospect of the young apiarist becoming more fascinated with bees than fearful of them. When he has found the charm of working bees, he will cast away the gloves, and he will find that the increased facility and comfort in working is but very slightly discounted by a very occasional sting. Be a gentleman to your bees, move quietly, do not jar or startle them, and they will respect you as they should !

Your stock of bees may be kept either in skep or bar-framed hives, though the skep, except as a receptacle for swarms, is not likely to have much place in scientific bee-keeping. If skeps are adopted, there will be little to do but pot the swarms, and at the end of the summer drive out the bees, or, as was the most usual practice, suffocate them by placing the hives over a pit in which sulphur is burning. But if the wooden or bar-frame hive is used, the results are very different. The number of bees in a stock is very much larger, they are very much more under the influence of the bee-keeper, their condition as to health, strength, and supply of stores can be easily ascertained, and, if found defective, more easily remedied. They are more accessible and respond more quickly to his energy and attention. The quality and quantity of the honey is very much improved, as brood and drones are kept apart from the stores in the supers. With the bar-frame hive, swarming can to a large extent be kept in check, and this should be aimed at in order to encourage the production of honey rather than bees. But in the skep no control can be effected, and the larger the number of swarms the better is the chance of a good return of honey.

In starting bee-keeping it is well to buy a swarm in May or early June; they will at once set to work in a manner that will be quite surprising, and by the end of the season, *i.e.*, in August (or September, if there is heather in the vicinity), the young beginner will have the pleasure of removing the honey-cakes well filled with the sweet syrup. The season will vary according to the pasturage; it will begin early in April, where apple and holly are numerous, but after the end of July few honey bearing flowers are to be found.

Never should the beginner buy old hives, unless a guarantee of a satisfactory nature is given that they are free of foul brood. He will be wise to have only hives of standard size, for these will then take American machine-made frames 14 inches long by $8\frac{1}{2}$ inches deep, and will carry above a rack for sections $4\frac{1}{4}$ inches square. Frames and sections of these sizes can be bought in most towns much better and cheaper than they can be made at home. Hives need not be expensive: a very useful hive can be knocked up from old packing cases, at a cost of 3s. or 4s. Your hives obtained, it is important to place them in the best position, if possible facing east, so that the first rays of the summer sun may tempt the bees out to start work. Not too near any footpath or road, though traffic behind hives will not disturb bees. Room must be left behind the hives for the operator to place himself and his smoker, &c., when working them. Protection from the north wind is desirable, but generally an open place is better than a confined or planted situation. High trees close by or overhanging the hives are bad, as swarms are sure to pitch high up in them, and if the swarms are not lost it will give great trouble to reach them. Bush apples, currant bushes, or other small trees near at hand are most convenient as swarm-catchers. The swarms cluster on a bush and are easily shaken off into a skep, or just shaken on to the ground and a skep placed over them.

As to *appliances*, though five to ten pounds may be well laid out on them, there is no necessity to go in for anything more than a bee veil and a smoker, and these may be obtained for an expenditure of five or six shillings. The *smoker* should be of large size, or at the critical moment when a puff of smoke is wanted to subdue the bees the fuel will be found to have gone out, and not a few stings may be the result. Besides these necessities the following articles will be found most useful: (1) A *stand* on which to hang frames, holding them in their natural position, the top forming a table for the smoker and a scraper. (2) A *ripener*, which is a large tin drum with a strainer over the top into which honey and combs may be put, the honey runs through into the drum below and can be drawn off by a tap: this is most useful in dealing with combs from skeps: in it the honey ripens and gains in texture and flavour. (3) A *solar extractor*, a box with a glass top arranged with a tray and a strainer, is no doubt a most convenient and clean way of extracting the wax from the combs, and producing the wax in the very purest condition. (4) If the hives are worked for extracted honey of course an *extractor* and *uncapping knives* are required, but these are expensive, and for the small bee-keeper who would only want them once or twice a year they may be dispensed with; he can get the use of one from the Bee-keepers' Association, if one exists in his district or county, or from a neighbour. Besides these, anyone wishing to keep bees should invest in the *British Bee-keepers' Guide Book*, by T. W. Cowan, published by Houlston and Sons, a small work containing a great deal of matter, without which a young bee-keeper will constantly be at a loss how to proceed.

The principal *diseases* that bees suffer from are dysentery, caused by bees feeding on watery or fermented food in cold weather, and foul-brood, caused by a bacillus which generally attacks the larvæ, causing them to die, and emit a very unpleasant and distinctive odour. Foul-brood is most difficult to eradicate, and in bad cases destruction by fire of stock and hive should be resorted to. The greatest safeguard against these diseases is to keep the stock strong and well supplied with stores. The same is the surest way of guarding against the ravages of the wax moth, a troublesome pest which may be seen hovering round the entrance to the hive on a summer's evening. The damage done to comb is seldom large unless the hive becomes weak, when the combs soon become riddled and covered with webs, so destroying the brood, and ultimately the stock.

As a stock of bees has to pass practically nine months of the year when no honey can be gathered, their safe preservation through that long period will depend mostly on being kept dry and warm, and well supplied with food. Warm quilts of old carpet, or blanket, or carpet felt over the frames, and chaff between the frames and the outer hive will keep out draughts. The entrance must, in winter, be reduced to the size of two bees. Towards spring, when the pollen on the hazel and flowering shrubs begins to stimulate breeding, a couple of pounds of soft candy may be necessary to keep up supplies; this will well repay the cost of the candy, the stock being strong and healthy, and ready for work directly the honey flow begins.

Bee-keeping should be practised in this country to a much larger extent than it is, the imports of honey alone average over £2,000 a month, and on a small holding the keeping of say half-a-dozen stocks in bar-framed hives may, with a limited expenditure of time and attention, well return on an average a five pound note. The writer, in the last four years, has averaged four pounds a year for honey sold from six stocks after supplying his own household needs, although one year he sold nothing, and this year the supply has been very small. Honey pays to produce at a much lower price than that at which it is usually retailed. The price of 10d. a pound for run honey in jars, and 1s. a pound for comb honey in sections, is far too high. If it more nearly approached the price of jam it would become one of the most popular, as it is one of the most wholesome, articles of the tea and breakfast table. And then the difficulty, so often complained of by bee-keepers, of being unable to find a market for their honey, would disappear.

In conclusion let me point out the moral teaching the bees give us. Bees are perhaps the most perfect example of collectivism in the animal world. As individuals they have not a very high intelligence: put one on the inside of a window, and she will go up and down in vain trying to get out, whereas a wasp will quickly find a way out if one exists. But collectively the spirit of the hive is of a high order; bees work in obedience to many laws that we have found out, and most likely they observe others as yet unknown to us. They are industrious, valiant, clean, frugal, and unselfish. Few persons ever press them into their service without growing to take an interest in them and without coming to look upon them as friends.

E. Powell King.

LITERARY AND DEBATING SOCIETY'S CONCERT.

A concert was held in the Out-Students' room on Monday, December 1st, but, owing to the inclemency of the weather, very few visitors were present at what turned out to be a very successful entertainment. There was no lack of performers; a reading by the Principal being very much appreciated, and Messrs. Wright and T. A. and F. Scully producing excellent music from their banjos. Thanks are due to all performers, including Mr. E. C. Cripps, who, though unprepared, kindly consented to sing; to G. W. S. Sparrow, who accompanied on the piano; and to T. A. Worsey, the energetic secretary of the Society.

THE R.A.C. LITERARY AND DEBATING SOCIETY'S DRAMATIC ENTERTAINMENT.

The annual amateur theatrical performances took place on Tuesday, December 9th, and though the weather was as stormy as it usually is when guests are invited to the College, the hall was filled with visitors. The piece chosen by the Society was Sydney Grundy's farcical comedy, "The Snowball," a play which seems to us to possess considerably more merit than most of those pieces within the reach of amateur players in an extemporised theatre. L. A. Solignac was very successful in the part of Felix Featherstone, especially when reduced to a state of abject terror by Mrs. Featherstone, his wife, and this powerful lady seldom allows him to pick up courage. G. C. Cox had already shown considerable dramatic ability in his recitations at entertainments given earlier in the session, so his capable performance as John Thornycroft was not unexpected. G. Dobson played well as Harry Prendergast, and appeared to be very much in love with a lady in a rose pink creation, Ethel Granger by name, and towards the end of the play—for it is a satisfactory play—the obstacles to their engagement are demolished. The part of Ethel Granger was satisfactorily rendered by D. H. Skelsey. T. A. Worsey was extremely successful as Mrs. Featherstone; a masculine voice is naturally a handicap to a lady, but Mrs. Featherstone really might have been the possessor of nothing less lady-like than fine contralto tones. Mr. Worsey is the secretary of the Literary and Debating Society, and one wondered how he had found time to organise and superintend the performance, and at the same time to become so proficient in the manipulation of his skirt; for the way in which he managed to run in such unwonted attire was the envy of all beholders. He is to be congratulated both on the excellent rendering of his own part and upon the success of the entertainment as a whole. G. G. Symons as Penelope, an attractive maid servant, acted creditably; and H. G. Browne as Alphonso was a satisfactory butler. The scenery and the arrangement of the stage were remarkably good, but we believe this goes without saying when Professor Paton undertakes work of this kind. In this case he was ably assisted by Messrs. Iredale, Stevens, Stockwell, and Middleton. "God save the King" was sung at the close of the entertainment. We think that even in Ciceter, where amateur theatricals take place in such constant and rapid succession, the R.A.C. Literary and Debating Society's performance of "The Snowball" must be accounted a distinct success.

R.A.C. STEEPLECHASE.

The annual steeplechase over a course of about two miles on the College Farm took place on December 11th. The ground was very hard, there were six starters and an exciting race for first place. J. E. de Grey Henniker looked like winning, but was beaten in the last few hundred yards by F. Scully. R. A. Ratcliff third, and T. A. Scully fourth.

THE ROYAL AGRICULTURAL COLLEGE CLUB.

The annual dinner of Old Students was held at the Holborn Restaurant on Wednesday, December 10th, but the attendance was very disappointing. Archibald Weigall was in the chair, and the company included T. A. Dickson, E. A. Stapleton, H. L. Brooksbank, Edric Druce, M. K. Bamber, A. H. Allcock, Osmond Smith, and E. B. Haygarth, &c. The small attendance was caused owing to a number of members and visitors at the last moment being unable from various reasons to keep their engagement. It was suggested that it might be desirable to hold a dinner at the time of the Royal Show in June. This might be a more convenient period of the year, and ensure a larger gathering.

OLD STUDENTS.

C. Henry Le Grice (M.R.A.C., 1892) has been appointed to the Agency of the Woolley Estates in Berkshire, extending to over 11,000 acres, belonging to P. Wroughton, Esq., in succession to the late J. Arthur Wallington.

DIPLOMA EXAMINATION.

The following gentlemen obtained the diploma of membership at the end of last term: Sheik Makbul Husain, B.A., Mr. Gervase Ashton Smith, and Mr. Richard Henry Keane. Mr. Husain obtained the Gold Medal. Don Pedro de Bertemati obtained the Associateship. The external examiners were Mr. J. J. Harle in Practical Agriculture, Dr. J. A. Voelcker in Agricultural Chemistry, Sir George T. Brown, C.B., in Veterinary Science, and Professor H. Robinson in Practical Engineering.

SCHOLARSHIPS.

The first and second Scholarships, awarded at the end of the Summer Term, were divided between W. H. Parker and W. W. Bell, whilst the third was awarded to R. W. Brigstocke.

BROWN ENTRANCE SCHOLARSHIP.

This has been awarded to H. S. Mathews. The scholarship is tenable for two and a third years.

"MILLER" FUND AND TRUST.

The "Miller" Fund, of about £200, collected for the benefit of the widow and five children of Mr. James Miller, who died May 26th, 1886, after teaching Drawing at the R.A.C. for nearly 26 years, was closed in October. All the children being now started in life, the Trustees, the Rev. W. P. Acworth, Edward Kinch, and E. Brownlow Haygarth, have handed the small remaining balance to the widow and closed the Trust.

CHLORINE IN RAIN WATER.

The rainfall for the six months ending September 30th last was 13·28 inches falling on 89 days; the rain contained, on an average, chlorides equivalent to ·77 grains of sodium chloride per gallon, this being equal to a deposit of 32·86 lbs. per acre. For the twelve months ending September 30th the rainfall was 24·69 inches, and the total chlorides in the rain equal to 50·28 lbs. of common salt per acre.

During the stormy time in August and beginning of September the prevailing winds were from the south west; this seems to have caused the amount of chlorides to be somewhat higher than usual. E. K.

FOOTBALL SEASON, 1902.

Characters of the XV.

H. P. Bouverie.—At back has had a trying time of it this term; collars well, but should learn to pick up cleaner.

G. G. Symons.—Half; plays an unselfish game, and saves well.

H. J. Fagan.—Half; has done some good work, but is much hindered by being short-sighted; has also played three-quarter.

D. Skelsey.—Three-quarter; one of the most useful members of the team; has played conspicuously well in every match; fast, collars well, and should prove of great service next year.

H. Matthews.—A very useful three-quarter, and knows the game; has played half.

V. R. S. Vickers.—Three-quarter; has been disappointing in his performances, but has done his best.

H. G. Browne.--Three-quarter; has hardly got sufficiently used to his place yet to show much result; should improve.

G. W. O. Huddart.—A hard working forward; has proved himself an energetic captain under somewhat depressing circumstances.

W. H. Parker.—Very keen forward; works very hard in the scrum; is a strong runner, and a good kick; played three-quarter in one match.

G. A. Lambert.—Forward; is always on the ball in the loose; energetic, and uses his weight in the scrum.

E. A. Iredale.—Forward; has played very well this term; good out of touch and can kick.

R. A. Ratcliff.—A most hard working forward; does not show up much, but is always on the ball, and does very useful work in the scrum.

T. W. Davies.—Not too fond of the centre of the scrum, but can play a good game when he likes.

H. C. Bell.—One of the most useful acquisitions the team has had; dribbles well, and always plays a hard game.

K. Mankowski.—A keen forward, and when he knows the game better should be useful; has also played three-quarter.

The following gentlemen have also played:—T. H. Stockwell, W. W. Bell, G. Dobson, H. J. Calder, G. C. Cox, J. O'Neill.

R. Adderley, Touch Judge. G. W. O. HUDDART, Captain.

The Berkshire Wanderers scratched their match with the College, being unable to raise a team. The following matches were played:—

R.A.C. v. Naunton Park (Cheltenham).—This match was played on Saturday, October 25th, and ended in a win for the visitors by 33 points to *nil*. The College team was as follows:—Back, H. P. Bouverie; halves, G. G. Symons, W. W. Bell; three-quarters, H. J. Fagan, V. R. S. Vickers, H. Matthews, J. O'Neill; forwards, G. W. O. Huddart, W. H. Parker, G. A. Lambert, E. A. Iredale, J. H. Calder, T. W. Davies, K. Mankowski, H. C. Bell; touch judge, H. G. Browne.

R.A.C. v. Cheltenham College.—Played at Cheltenham on Wednesday, November 5th, and resulted in a win for the home team by 26 points to *nil*. College team:—Back, H. P. Bouverie; halves, G. G. Symons, H. J. Fagan; three-quarters, D. Skelsey, H. Matthews, V. R. S. Vickers, H. G. Browne; forwards; G. W. O. Huddart, W. H. Parker, G. A. Lambert, E. A. Iredale, J. H. Calder, R. A. Ratcliff, T. W. Davies, H. C. Bell; touch judge, R. Adderley.

R.A.C. v. St. Paul's College (Cheltenham).—This match was played at Cheltenham on Saturday, November 15th, the home team winning by 32 points to *nil*. College team:—Back, H. P. Bouverie; halves, G. G. Symons, H. J. Fagan; three-quarters, D. Skelsey, V. R. S. Vickers, H. G. Browne, H. Matthews; forwards, G. W. O. Huddart, W. H. Parker, G. A. Lambert, E. A. Iredale, T. W. Davies, H. C. Bell, G. C. Cox, K. Mankowski.

R.A.C. v. Magdalen College (Oxford).—Played at Oxford on Saturday, November 22nd, the Oxford team winning by 51 points to *nil*. College team:—Back, H. P. Bouverie; halves, G. G. Symons, H. J. Fagan; three-quarters, D. Skelsey, H. Matthews, W. H. Parker, K. Mankowski; forwards, G. W. O. Huddart, E. A. Iredale, R. A. Ratcliff, T. W. Davies, H. C. Bell, T. H. Stockwell, and H. G. Browne, in place of G. A. Lambert, who was too unwell to play.

R.A.C. v. Pembroke College (Oxford).—This match was played at the R.A.C. on Wednesday, November 26th, the visitors winning by 26 points to *nil*. College team:—Back, H. P. Bouverie; halves, W. W. Bell, H. Matthews;

three-quarters, D. Skelsey, H. J. Fagan, K. Mankowski, G. Dobson; forwards, G. W. O. Huddart, W. H. Parker, G. A. Lambert, T. W. Davies, E. A. Iredale, R. A. Ratcliff, H. C. Bell, G. C. Cox; touch judges, H. G. Browne and R. Adderley.

Mr. W. H. Parker's Team v. Stroud.—Stroud won by 38 points to *nil.*

GOLF.

The match between the R.A.C. and Sapperton Park clubs was played over the Sapperton Park links in very bad weather on November 8th, when the home team had an easy victory by 13 holes.

R.A.C.		Sapperton Park.	
E. B. Haygarth	0	J. Rawlins	0
G. Paton	2	E. C. Cripps	0
G. T. Locke	0	H. St. G. Rawlins	2
G. H. Wooldridge	0	E. C. Sewell	9
G. E. Morrison	0	R. J. Mullings	2
H. G. Berkeley	0	G. P. Smith	6
G. S. West	4	R. Stuart	0
	6		19

On the same day, G. T. Locke was second for the Monthly Medal, with a very creditable 84 nett.

The Senior Cup was played for on December 12th, and was won by E. C. Villiers with a gross score of 97. His handicap of 12 reduced this to an 85.

	Gross.	Hcp.	Nett.		Gross.	Hcp.	Nett.
E. C. Villiers	97	12	85	Prof. Blundell	108	4	104
G. E. Morrison	100	12	88	C. D. Gamble	120	15	105
Prof. Locke	99	4	95	H. G. Berkeley	125	12	113
Prof. Wooldridge	106	7	99				

Junior Cup.

	Gross.	Hcp.	Nett.		Gross.	Hcp.	Nett.
W. W. Bell (winner)	110	22	88	H. Middleton	120	20	100
W. H. Parker	111	18	93	E. A. Iredale	131	23	108

The Handicap Foursomes was won by Prof. Locke and C. E. Ermen (7), who beat Prof. Blundell and G. M. Dobson (4) 8 up and 6 to play.

BILLIARDS.

The following gentlemen entered for the American Billiard Handicap of 200 up:—

Prof. Paton	scr.	C. E. Ermen	60	R. Adderley	70
Prof. Locke	10	W. H. Parker		T. W. Davies	
Prof. West	20	G. Middleton		T. H. Stockwell	
E. W. Farwell	40	T. A. Worsey		E. A. Iredale	80
K. Mankowski		H. G. Browne	65	G. E. Morrison	
Prof. Wooldridge		A. Gomez		W. D. Stevens	
W. W. Bell	55	D. H. Skelsey		G. M. Dobson	90

First prize, Prof. West; second prize, W. H. Parker; third prize, G. E. Morrison.

Reviews.—Owing to pressure of space we are obliged to hold over our Reviews till next issue.

Erratum.—In last part, page 29, line 9, *for* Past *read* Present; the Present having won the Lawn Tennis match against Past Students by 5 games to 4.

THE LIBRARY OF THE
DEC 4 - 1930
UNIVERSITY OF

LIBRARY OF THE UNIVERSITY OF ILLINOIS

NEW SERIES.
Vol. XI. Part 3.

APRIL, 1903.

Price 1s.

AGRICULTURAL STUDENTS' GAZETTE.

EDITED BY

STUDENTS AT THE ROYAL AGRICULTURAL COLLEGE,
CIRENCESTER.

CONTENTS.

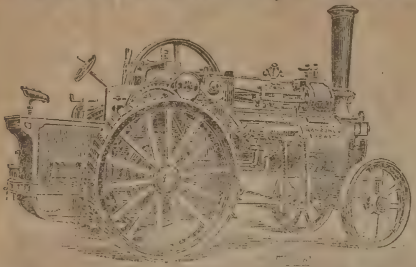
PAGE
ON THE PROGRESS OF THE VALUATION OF UNEXHAUSTED MANURES FROM THE CONSUMPTION OF FOODS 67
NOTES ON FORESTRY. A. L. Pelham 71
AGRICULTURAL TECHNICALITIES. George W. Raikes, F.S.I. 74
REMARKS ON THE PRACTICE OF A GENERAL LAND AGENT AND SURVEYOR. J. H. O. 77
THE AGRICULTURAL EXODUS. E. W. Harrison 79
REMINISCENCES OF A RESIDENT LAND AGENT. W. G. M. L. 81
AGRICULTURAL EDUCATION. H. J. Marshall 83
PAGE
THE FEEDING OF HAY TO PIGS. Alex. E. MacLeod. 85
A NEW ALGA FROM THE BOTANICAL GARDEN, R.A.C. 87
PRESENTATION TO THE COLLEGE MUSEUM 87
DIPLOMA EXAMINATION AND SCHOLARSHIPS 88
OLD STUDENTS 88
OBITUARY. J. H. 88
THE COLLEGE SPORTS ... 89
PLOUGHING COMPETITION ... 94
FOOTBALL 94
GOLF 95
R.A.C. BEAGLES 96
BILLIARDS 97
REVIEWS 97

ALL RIGHTS RESERVED.

CIRENCESTER: ALFRED T. HARMER, MARKET PLACE.

APPOINTED BY ROYAL WARRANT MANUFACTURERS OF AGRICULTURAL MACHINERY
TO HIS MAJESTY KING EDWARD VII

RANSOMES, SIMS & JEFFERIES, Lᴰ.

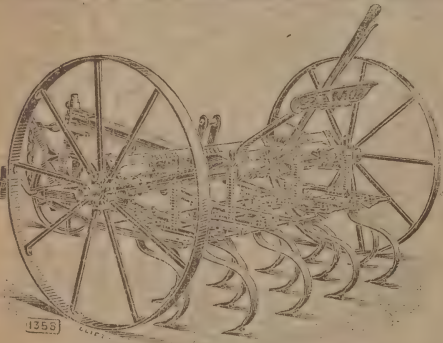


MANUFACTURE THE BEST
TRACTION ENGINES,
PORTABLE ENGINES,
VERTICAL ENGINES,
HORIZONTAL ENGINES
AND BOILERS.

Excellent designs, first-class materials and workmanship; ample strength in all working parts; large bearings and cylinders; ample steam space.

FINISHING
STEAM THRASHING MACHINES.

R., S. & J. have supplied Thrashing Machines to HIS MAJESTY THE KING, for the Sandringham Estate, and to the late QUEEN VICTORIA, for the Prince Consort's Shaw Farm, Windsor.



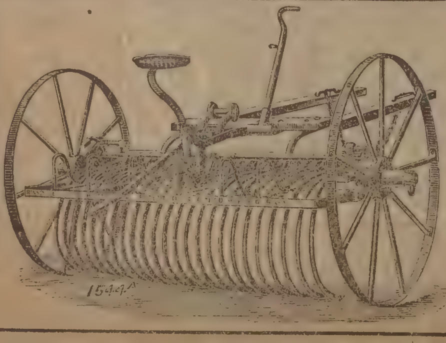
"THE IPSWICH"
STEEL CULTIVATOR.

The strongest, best, and most perfect Machine in the market. The spring of the teeth keeps everything alive. Can be fitted for two or three horses.

Also
"SMALL HOLDINGS" and
"TRIPLEX" CULTIVATORS.

IRON AND WOOD PLOUGHS,
2 AND 3 FURROW PLOUGHS,
CHILLED DIGGING PLOUGHS.

R., S. & J., Ld., have been manufacturers of Ploughs for nearly a century, and the Chilled Plough Share was invented by Robert Ransome in 1803.



NEW "G.M.C." GENERAL PURPOSE RAKES.
THROUGH AXLE RAKES.
SELF-ACTING & MANUAL RAKES.
HAYMAKERS.
SWATHERS, &c.

◆ ◆ ◆

FULL ILLUSTRATED CATALOGUES
FREE BY POST ON APPLICATION.

◆ ◆ ◆

ORWELL WORKS, IPSWICH.

NEW SERIES.

Agricultural Students' Gazette.

VOL. XI. APRIL, 1903. No. 3.

ON THE PROGRESS OF THE VALUATION OF UNEXHAUSTED MANURES FROM THE CONSUMPTION OF FOODS.

About the year 1860 J. B. Lawes published a table showing the average composition of the chief feeding stuffs and other agricultural products, and calling attention to the fact that there must be a great difference in the value of the manure according to the composition of the food consumed. A table showing the estimated money value of the manure from the consumption of one ton of various foods was soon afterwards published.

In 1870 Lawes read a paper before the London Farmers' Club on the "Exhaustion of the Soil, in relation to Landlord's Covenants, and the Valuation of Unexhausted Improvements."

Mr. Gladstone's Irish Land Act of 1870 distinctly says that an outgoing tenant is entitled to claim compensation for "tillages, manures, and other like farming works, the benefit of which is unexhausted at the time of the tenant quitting his holding."

In the spring of 1875 Lawes—in prospect of the coming Agricultural Holdings Act—published a paper in the Journal of the R.A.S. England, "On the Valuation of Unexhausted Manures," in which his former table was amplified and slightly altered. This paper probably first called the attention of the mass of farmers to the importance of the subject, and to the fact that there were very great differences in the manure-value of different foods. In 1875, too, the Duke of Richmond's "Agricultural Holdings Act" was passed, one of whose objects was to give compensation to the tenant for unexhausted improvements, but as its provisions were not compulsory it produced little effect.

In this table the total money value of manure from one ton of decorticated cotton cake was £6 10s.; linseed cake, £4 12s. 6d.; oats, £1 15s.; meadow hay, £1 10s. 6d.; swedes, 4s. 3d.

In 1876, owing to the action of the Council of the R.A.S.E. and its Chemical Committee, the experimental farm at Woburn was, through the great liberality of the Duke of Bedford, started mainly in order to test practically the value of Lawes' deductions as to the value of the manures produced by the consumption of different foods.

In 1883 a new Agricultural Holdings Act became law.

In 1885 Lawes and Gilbert produced in the J.R.A.S.E. a paper on the "Valuation of Unexhausted Manures," which set forth very fully and clearly the methods by which they arrived at the estimate of the total original manure value of thirty-six different foods, and the way in which they suggested this value should be applied in arriving at the *compensation value.*

In this paper the total original manure value of one ton of decorticated cotton cake was £5 13s. 0d., of linseed cake £3 18s. 6d., oats £1 6s. 1d., meadow hay £1 8s. 7d., and swedes 4s. 7d.

In the meantime valuers and farmers had been gradually coming round to the belief that manure from foods rich in nitrogen was of higher value than that from foods poor in nitrogen, and although valuers almost invariably gave compensation on the basis of the cost of the food, yet in most cases they gave a higher proportion of the cost in the cases of cakes and leguminous seeds than in the case of cereals.

In 1897 Lawes and Gilbert again revised their tables, since a considerable drop had taken place in the money values of most manures. In the revised table the total original manure value of one ton of decorticated cotton cake was £3 14s. 9d., of linseed cake £2 11s. 11d., oats 19s. 9d., meadow hay 18s. 7d., and swedes 2s. 11d.

In all the tables above quoted the manurial value of the food was calculated after it had been fed to fattening animals only.

In 1898 Lawes and Gilbert published another set of tables, giving the manure value of foods after being fed to cows in milk, which take much more out of the food than fattening animals. Thus, for example, with a cow giving eight quarts of milk a day the original manure value of a ton of decorticated cotton cake comes out at £3 9s. 2d., of linseed cake £2 6s. 0d., oats 15s., meadow hay 16s. 3d., and swedes 2s. 8d.

In all these tables the sums quoted are the *original manure values* calculated on the value of nitrogen (or ammonia), phosphoric acid, and potash at certain stated prices. But allowance must be made for unavoidable loss and for the fact that farmyard manure is a somewhat slow acting manure; and the authors suggest that 50 per cent. of this money value should be taken as the compensation to be given for the consumption of one ton of the foods during the current year; *i.e.*, the *present worth* of the manure from one ton of these foods on average well-managed farms is taken at *one-half the above figures.* When the consumption is continuous, a scale of compensation extending over the amount consumed during the last eight years is suggested, and tables of figures are given in the last three papers showing the amounts so allowed.

These scales were, probably, never adopted in their entirety. They were too complicated, and extended the term over which compensation for the consumption of foods was allowed through too long a period. The valuer would not adopt them. But they served at least to call attention to the subject, and have helped to modify the schemes of many influential bodies; notably that of the Newcastle Farmers' Club.

In 1900 the Agricultural Holdings Act was amended, and compensation given for corn grown on the farm, and for foods consumed by horses other than those regularly employed on the farm.

In 1902 the Central Chamber of Agriculture appointed a Committee to "draw up a scale of compensation for unexhausted improvements, to be sent down for consideration by the local chambers." This Committee confined itself almost entirely to the question of compensation for the consumption of foods. They examined many witnesses and drew up a carefully considered report.

At the end of 1902 Dr. J. A. Voelcker and Mr. A. D. Hall, who were two of the witnesses examined by the Central Chamber Committee, published a paper in the *Journal of the Royal Agricultural Society* on "The valuation of unexhausted manures obtained by the consumption of foods by stock." They have practically adopted the tables of Lawes and Gilbert as far as the composition of the food is concerned, but have modified the money value of the constituents. Lawes and Gilbert, in 1897, took the value of ammonia at 4d. a pound, phosphoric acid at 2d., and potash at 1½d. a pound. Voelcker and Hall take ammonia at 5½d., phosphoric acid at 2d., and potash at 2¼d. : but, for simplicity, use the value per "unit" per ton in calculating, and take nitrogen at 12s. a unit, phosphoric acid 3s. a unit, and potash 4s. a unit. The first and last prices per unit agree with the prices per lb., but 2d. a lb. (phosphoric acid) is nearly 3s. 9d. a unit. Then Voelcker and Hall, mainly from observations made during the feeding and manuring experiments at Woburn and from the consideration of some continental experiments, consider that about one-half of the nitrogen of the food appears in the finished manure. Five to ten per cent. is retained in the animal or its products and 30 to 40 per cent. is lost in making the manure, under average circumstances. Less phosphoric acid and potash is lost, and they recommend that compensation be paid on the basis of one-half the nitrogen, three-quarters the phosphoric acid, and all the potash contained in the purchased food consumed during the last year. They also extend their scheme of compensation over four years only—the time of an ordinary rotation. For the second, third, and fourth years, the compensation value is taken as one-half that of the immediately preceding year.

On this scale the *compensation value* for a ton of Decorticated Cotton Cake consumed in the last year is £2 16s. 5d., for Linseed Cake £1 18s. 7d., for Oats 15s. 5d., for Meadow Hay 16s. 4d., and for Swedes 2s. 6d.

The Central Chamber of Agriculture adopted their Committee's report, in which the scheme of Voelcker and Hall is still further simplified. Thus they cut out the fourth year's compensation altogether and allow for three years' consumption only; the values of the last year's consumption is nearly the same as in Voelcker and Hall's paper but odd pence are knocked off, and many foods which approximate in manurial value are lumped together at the same price.

In this scheme the compensation for the consumption during the last year of a ton of Decorticated Cotton Cake is £2 16s., of Linseed Cake £1 18s., Oats 14s., Meadow Hay 15s., Swedes 2s. 6d. This works out in many cases singularly near the value deduced from Lawes and

Gilbert's tables of 1885, when the compensation value for the last year's consumption is one-half the original manure value. For the last year but one the compensation per ton is (with two exceptions) one-half of that of the last year, and for the last year but two one-half of that again. But roots, hay, and straw receive compensation for two years only.

This scheme, propagated in January of this year, has already received the adhesion of many Chambers of Agriculture, and no doubt will be widely adopted.

Thus after more than forty years from Lawes' first paper, the principle that compensation for unexhausted manure residues of foods should be given on a basis of the manurial value and not on the basis of the cost price of a food will be generally adopted.

It is clearly quite impossible to fix any scale which shall apply to all qualities of farms and all kinds of farming. Many are of opinion that land should be first divided into three classes as to quality, and then into arable and pasture; but the Committee concluded that no division of this kind would be elastic enough to meet all cases. The scale they have recommended is to suit *average* cases, to be increased or decreased according to the special circumstances of each case. The recommendations of the Committee are valuable, and as they cannot be too forcibly insisted on we will reproduce them here :—" It is imperative that the valuers shall, in each case, take into account such matters as—

What proportion, respectively, has been fed direct on arable land, and on grass?

What proportion, respectively, has been fed to milk cows, to young stock, and to fattening stock, or sheep, or pigs?

Has the manure been made in covered yards and boxes, or in open yards?

Has the manure been afterwards properly cared for, and has it been judiciously applied?

Is the soil of a retentive nature?

Is the land clean, well drained, and well cultivated?

Is the course of cropping adopted of an exhaustive nature?

Has the consumption of purchased feeding stuffs been of long continuance?

What crops, if any, have been grown since the application of manurial constituents?

That as a guide to compensation, after taking all these matters into consideration, they recommend that the table—from which we have taken examples above—of the compensation values of the food stuffs in most common use, based on the last three years' consumption, shall be adopted as a fair average, to be increased or decreased according to the special circumstances of each case."

In the nature of things there can be no finality in such a scheme, but by the intelligent application of this, probably substantial justice will be done all round; and its weaknesses will be found out and no doubt remedied as it comes more and more into use.

It has been customary to allow compensation for purchased foods consumed during the last year only to the extent of the average consumption during the three last years. This limitation was right when compensation was based on cost price of the food, but is not so necessary when compensation is based on manurial value only, and the Committee did not think that any such limitation would be upheld by law.

A rather weak point in the scheme and report seems to be the want of elasticity in fixing the prices per unit on which the compensation value of the foods is calculated. No doubt the present prices of 12s. a unit for nitrogen, 3s. for phosphoric acid, and 4s. for potash are nearly correct, but these prices were lower in 1897, and might easily again become lower, or on the other hand they may become higher. Still the compensation for a ton of linseed cake consumed remains on the basis of £1 18s. Some plan by which the compensation would automatically rise or fall with the price of artificial manures or, as suggested by one of the Committee, with the price of farm produce grown with the aid of such manures, might fairly easily be devised.

The Gloucestershire Chamber of Agriculture and the Cirencester Chamber of Agriculture have, at recent meetings, adopted the scheme of the Central Chamber of Agriculture.

NOTES ON FORESTRY.

The subject of Forestry has attracted a good deal of public attention latterly, and the planting of woods has been recommended by various writers in various parts of Great Britain. There are obviously many points of view from which this subject can be regarded. I may instance an article in the March number of *The World's Work*, entitled "Our Forestry Problem," as the latest pronouncement on the need of increasing our production of timber from a national point of view. The author, Professor Schlich, of Cooper's Hill College, gives most valuable statistics showing the increasing consumption of timber in this country, the countries from which the supply is procured, and the increasing difficulty in keeping up that supply. The resulting increase of price, which he estimates as 18 per cent. during the five years 1894-99, is of great importance, both as proof of the scarcity of the world's supply of timber, and as an encouragement to the owners of land in this country to increased production. The increasing demand for timber in the United States will before very long absorb all that Canada can supply, and for the same reason the amount we are accustomed to procure from various European countries can not long be maintained except at steadily increasing prices. For the purposes of this paper, perhaps, enough has been said as to the importance from a national point of view of greater production of timber in this country, nor do I propose to deal with the question of what the government ought to do, or is likely to do, in order to remedy the present or future scarcity. A good many years ago I remember reading a most interesting Blue Book on Forestry. One of the witnesses, I think, suggested that the woods in Lord Bathurst's park, so conveniently situated near the Agricultural College, should be utilised by its students for purposes of experimental forestry. The late Lord Bathurst, however, though willing to allow any reasonable facilities for observation, was very naturally not prepared to sanction any interference with the management of his woods. These woods, indeed, have had a good reputation since the days of the poet Alexander Pope, whose traditional seat in the Avenue was in my time often associated with his spiritual chief, the Pope of Rome. This leads to the consideration of one of the greatest difficulties in the way of encouraging tree-planting in this country, viz., that nearly all the land available for planting is private property. It is true that the Crown estates, managed by the Commissioners of Woods and Forests, have a considerable area of forest under their control, but in the case of the only two large forests, viz., the New Forest and the Forest of Dean, they are in great measure hampered—in the New Forest by common rights and by Acts of Parliament framed with a view to treating it as a sort of national recreation ground, and in the Forest of Dean, in a lesser degree, by the common and free mining rights of the inhabitants. In spite of these disadvantages, however, the Forest of Dean, till lately for many years under the charge of Sir James Campbell, has had the rare honour of commendation of a distinguished French expert in Forestry, and I have heard equally satisfactory reports of his successor, Mr. P. Baylis. In addition to these and other forests, the Crown have various estates scattered about the country, parts of which are available for planting. But it is an obvious fact that as regards the interests of Forestry, England is, as compared with European countries, severely handicapped. In Germany, for instance, not only are these great forests owned by the State, but the forests of private proprietors are subject to strict regulations as to cutting and re-planting. Moreover, it seems at first that we have but a poor chance of inducing English landowners to plant woods, or what is of at least equal importance to manage their existing woods on a scientific system. As regards planting on an extensive scale, however sanguine one may be of a future profit, it is impossible to deny that it involves a present outlay which many owners are ill able to afford. But it must be remembered that an average landed estate is a consumer of timber to a very considerable extent. As an example, the scarcity of ash timber and the high price when it has to be bought, is already a matter of some importance. Now, the Ash is a tree which is easily grown in mixed woods, is profitable at almost any age up to fifty or sixty years, and if grown by itself in most sheltered spots has always been acknowledged to pay very well. "Instead of which" (as the judge remarked of the man who went about stealing ducks) we too often see aged trees, obviously decaying, and so situated that their picturesque qualities can only be admired by an occasional beater.

Speaking of Ash trees one is almost necessarily led to allude to their natural enemy, more fatal than neglect, yet not difficult to subdue and even exterminate by resolute and continued measures of repression. I allude of course to the rabbit. This animal is destructive to all young trees, but is more especially fond of young ash, the bark of which seems to suit him better than any other food. From a sportsman's point of view the rabbit is of little value in large woods, and his bustling restless habits are a constant annoyance to hares and pheasants. A few, no doubt, must be kept as food for foxes, but no more than may be considered necessary for that purpose. Next to the rabbit I consider the average game-preserving landowner the greatest obstacle to the improvement of our woodlands. There are many, I admit, who take a great interest in their woods, and a few who really understand the subject, but the greater number are either entirely ignorant of woodcraft or are accustomed to consider their woods too much from the gamekeeper's point of view. Many seem to think it almost a sin to cut down a tree, while others only take an interest in the ornamental portion of the woods, leaving the rest to the care of the Agent or the Forester. When the marking of trees for cutting is done by the owner it is seldom completely carried out, and when it is remembered that this tedious, though important operation, is usually performed in the coldest and shortest days of the year, one cannot but sympathise with the owner. The gamekeeper's influence on the management is generally prejudicial and often fatal to good cultivation. His notions as to the best state of the woods with respect to the comfort of his pheasants are often the merest prejudice.

The one great alteration needed in wood management is the substitution of the German system of thickly planted and sparsely thinned trees, for the present haphazard system of trees dotted about, with branches low down the stem.

Workers in wood are quite surprised to find that the red and white deal they import are exactly the same trees as our Scotch and Spruce. The reason these foreign deals are immensely preferred to the native product is merely that they have no large knots, their lower branches having been killed in their youth by this system of close planting.

In Scotland there are some splendid forests of Scotch fir and larch, as well grown as those of Germany. In old days, when most of the oak was required for shipbuilding, these spreading trees, with huge limbs, were no doubt the best suited to their intended purpose. Now, it is long, straight, nearly branchless stems that are required.

In conclusion I should like to recommend most strongly a book called *The New Forestry*, by John Simpson, a practical forester, and published at Sheffield.

If these few notes, vague and ill-connected as I feel they are, induce some of the landowners and land agents of the future to take more interest in this great subject of British Forestry, I shall feel they have not altogether been written in vain.

A. L. PELHAM.

AGRICULTURAL TECHNICALITIES.

Nothing, perhaps, damps down the natural ardour of the student to a greater extent than to be continually reminded that however thoroughly he pursues his studies, and although he may be possessed of considerable natural ability, he can never hope to make his way in the world without experience. In other words, that although he may have made the most of his educational opportunities, and have won honours of all sorts and kinds, he still has to look forward to many years in subordinate positions, where he may gain the necessary experience before being entrusted with more responsible work. In no profession is experience more necessary than in that of a country Land Agent, and the question must often present itself to members of the R.A.C. how best to employ their time after leaving College until they can get established in professional life. The majority of young fellows are apt to aim somewhat high, and, if their means allow them to do so, will pass many years as pupils, spending large sums in premiums without any very adequate return. It is not the object of this article to dictate any particular line of action under these circumstances, but rather to point out how, in many ways, useful experience may be quickly gained at little or no expense. It is wonderful what information may be obtained by perusing the market reports of any newspaper, and yet how useless this information is unless the reader takes the trouble to find out the meaning of the prices quoted. For instance, I see the following: Maize inactive, 20s. ! ! ! 20s. for what? Oh, for a quarter of maize. Well, what is a quarter of maize? Does everyone know that it is eight bushels of 60lbs. each? Again I read: Whitechapel hay and straw.—Straw, 28s. to 38s. per load. What is a load of straw in London? Not a ton, because the same paper quotes straw in Birmingham at 60s. to 70s. per ton. No! A load is 36 trusses of 36 lbs. each, or 1,296 lbs. So the price is practically the same on both markets.

In the South of England the value of fat stock is quoted at so much per stone of 8 lbs., in the Eastern Counties at so much per stone of 14 lbs.: but the figure is much the same, because in the former case it is 8 lbs. of carcase, and in the latter 14 lbs. live weight. The theory is that 8 lbs. of meat is equivalent to 14 lbs. live weight. In practice, however, this proportion will only be realised in exceptionally well fed or matured animals, the live weight of which has been ascertained after several hours fasting. Of course, in the case of sheep the weight of the fleece will make considerable difference, especially if not dry, and my own experience tells me that it takes quite a ripe Shropshire teg at twelve months old to produce *half* its live weight in carcase flesh.

In the Midland Counties it is the custom to describe the weight of fat sheep and cattle at so much per quarter, in the case of sheep at so many pounds per quarter, carcase weight, and in that of cattle at so many scores of pounds + odd pounds per quarter. A Southerner who has been in the habit of calculating in stones will find the Midland custom difficult to get hold of for some time; but the calculation is very simple when understood. We will suppose that he has lately settled in the Midland Counties, and that he has a score of fat sheep and four fat bullocks penned for sale at the local auction. His opinion is that his sheep will weigh 9 stones, and his bullocks 80 stones each, but if asked by the natives he must convey his opinion in other language if he wishes to be understood. In the case of sheep he must reduce his stones to pounds and then to quarters, thus $9 \times 8 \div 4 = 18$, or by simply doubling the number of stones he gets 18, i.e. 18 lbs. per quarter. Now for the bullocks: 80 stones $\times 8 = 640$ lbs. $\div 20 = 32$ scores $\div 4 = 8$ scores per quarter, so that by simply striking out the 0 from any round number of stones you get the number of scores per quarter.

The local weights and measures of grain and seeds are far more complicated, and are almost invariably heavier per bushel for farmers' deliveries of home-grown produce than for dealers' deliveries of foreign. For instance, English barley is almost always sold at per quarter of 8 bushels of 56 lbs., whereas foreign barley is bought at per quarter of 400 lbs., i.e., 8 bushels of 50 lbs., a difference in weight of 48 lbs. in every quarter. English black oats are usually sold at per quarter of 8 bushels of 40 lbs., the same thing in other words as per sack of 8 scores or 160 lbs. English white oats are usually made up at 45 lbs. per bushel or 9 scores per sack, whereas foreign oats whether black or white are sold by the quarter of 8 bushels of 39 lbs. net, i.e., including the weight of two sacks, 304 lbs., or a deficiency of 16 lbs. per quarter from English black, and 56 lbs. per quarter from English white oats. The old system of selling corn by struck measure, without reference to weight, is quite out of date; but it behoves the seller to know the weight of what he is selling. I well remember once offering a dealer a very fine sample of white Newmarket oats which I had not weighed. I asked a stiff price, which was or promply agreed to if I would make them measure. I did not think there was much in it and agreed to do so, but found on measuring up that the oats weighed 50 lbs. per struck bushel, so that I made the dealer an unintentional present of 5 lbs. × 8 or 40 lbs. on every quarter sold. The usual weight of a bushel of wheat is 62 lbs.* I have known the natural weight by struck measure vary, according to condition and quality, from 59 lbs. to 65 lbs., and the worse the condition, i.e., the colder and damper the grain is, the more it swells and the lighter it will weigh per bushel. Probably few practical farmers could tell you off hand that dry wheat is heavier than water, although it is very easily proved by throwing a handful into a bucket of water and seeing it sink, and by sending a few sacks of damp corn to be kiln dried and measuring it on return anyone can prove for himself the shrinkage in bulk, but not in value, that takes place. Wheat is sold in the South of England by the load of 40 bushels, on Mark Lane by the quarter of 8 bushels, and in the Midlands by the bag of three bushels, Foreign wheat is always sold in Liverpool by the cental of 100 lbs. A useful formula to remember is that one quarter, i.e., 8 bushels of 62 lbs = 496 lbs., and is practically equivalent to five centals (500 lbs.) of foreign. To carry this formula to a practical issue, if a cental of hard Duluth, i e., American red wheat, is quoted at 6s. on the Liverpool Market, a quarter of sound dry English wheat is worth near about 6 × 5 or 30s. to the country miller, any little advantage in the quality of the American wheat being counterbalanced by the cost of carriage from nearest sea port.

---

* The official or imperial measures on which the price of corn is averaged for making out the value of tithes are as follows:—1 quarter of wheat 480 lbs., 1 quarter of barley 400 lbs., 1 quarter of oats 312 lbs., which are fair considering the quantity of light or tail corn which farmers use for feeding purposes and which never comes on the market.

Another simple formula which I have constantly found useful in practice is that £9 6s. 8d. per ton = one penny per lb., especially in calculating the daily cost of feeding animals of all kinds. I do not pretend that calculations on this basis are strictly accurate, but they are quite nearly enough so for one's own information even if £10 is taken as the basis instead of £9 6s. 8d. My meaning is as follows: If £10 per ton represents a little more than one penny per lb., £5 bears the same proportion to one half-penny, and any other figures can be readily worked out either in decimals or fractions of one penny. For example, you are suddenly required to state the cost of 300 lbs. superphosphate and 100 lbs. nitrate of soda; if you know the value per ton of each you will also know that the former is worth one farthing and the latter one penny per lb., or at any rate quite nearly enough so as to give a sensible answer. The following rough and ready calculations will also be found useful: We all know that one acre of land contains 160 square perches of $30\frac{1}{4}$ square yards, or a space which measures $5\frac{1}{2}$ yards each way; with a little practice it is comparatively easy for even a short-legged man to step a pole of $5\frac{1}{2}$ yards in 5 long paces—almost any skilled labourer can do it very accurately. It so happens that in spreading manure a square pole or perch is the most convenient space over which to spread evenly a heap of manure placed in its centre; this being admitted, it is obvious that as 160 heaps of manure are required per acre, you can readily regulate the number of loads you wish to put on by dividing each load into a certain number of heaps thus:—

4 lumps per load = 40 loads per acre and 160 lumps per acre.
5 „ „ = 32 „ „ „ 160 „ „
8 „ „ = 20 „ „ „ 160 „ „
10 „ „ = 16 „ „ „ 160 „ „

Most carters know this, but they don't know why.

An ordinary sheep hurdle measures rather over 6 ft. 6 ins. in length and it will be found in practice that, roughly speaking, 1,000 square hurdle spaces will occupy as nearly as possible one acre of ground. Supposing a farmer has, say, seven and a half acres of some particular crop which he wishes to fold his sheep over so that it shall last them 60 days. The total area of the piece of ground is 7,500 square hurdles, which, divided by 60, gives 125 square hurdles as the size of each day's fold. He therefore tells his shepherd to pitch his fold about 12 or 13 hurdles by 10, and makes sure of his keep lasting the time required. Such are a few of the simplest agricultural technicalities that occur to me at the moment. There are many similar ones in every other branch of the business of land agency, quickly picked up in actual practice, but seldom taught in the dull routine of handbook knowledge.

George W. Raikes, F.S.I.

REMARKS ON THE PRACTICE OF A GENERAL LAND AGENT AND SURVEYOR.

I well remember hearing my seniors, when I first went into the business of a General Land Agent and Surveyor, say that they never had any fresh business that was not in some way different from anything they had had before. In my ignorance I could not understand this, and thought that, after all, those members of the profession who had reached the top of the tree did not know so very much. Time and experience have taught me that they were right and I was wrong. I think I can say that there is no business or profession in which a man is expected, and if he wishes to succeed, has to have a general knowledge of more subjects than in that of a General Land Agent and Surveyor. In other words, I might put it that no other calling has more branches or varieties. This is no doubt one of the reasons that makes it appear so attractive to the young man leaving school or college who is asked by his parents to choose his line in life. I have often had it said to me by friends (not professional brethren) "How ever can you give an opinion as to the value of land in, say Lincolnshire, when your business is carried on in London? Or how can you know the value of timber in Devonshire? Or again, you cannot fix the compensation to be paid for taking land under compulsory powers a hundred miles or more from where your offices are?" Why not? The answer is that the principles are the same, and with the application of a reasonable amount of ability, common-sense, and, above all things, energy, there is no reason why a satisfactory result should not be obtained, and a sound opinion given.

You may wonder why I should start thus in writing to the *Gazette* of an Agricultural College. I will tell you why.

I was at the College myself, and since I left have been for between fifteen and sixteen years in business in London as a Land Agent and Surveyor. Now during this time one thing has struck me very much. So many young fellows say, "I had no idea I should have to do this kind of work," or if they do not say it in so many words, distinctly show it: and this remark applied equally to myself when I first came to the office. It may be true that the majority of the Students join the College with the intention of becoming purely resident Land Agents or Farmers at home or abroad. To these my remarks will not apply so strongly, although they will find their calling very varied. On the other hand I know there are many whose intention is to enter an old established firm of Land Agents and Surveyors in London or some large Provincial Town, or at any rate to follow that branch of the business. These I would specially ask to read and remember this poor attempt to open their eyes and help them in their future career.

There are many things that you have the opportunity of studying at the R.A.C., which some may think waste of time, and others cannot see the use of.

I have pointed out above the unexpected varieties of a general business, consequently the larger the variety of subjects you now have the opportunity of receiving a training in, the better you will be suited to grasp the business application of them when your turn comes for starting in earnest.

One of the branches of a General Surveyor's business, which I have referred to above, is the Assessing of Compensation for land, buildings, etc., taken under compulsory powers. This branch alone has very many varieties.

We now live in what may be called a very "go-ahead" age, which applies just as much to the Surveyor as to any other profession or business. I feel certain in this line the Surveyor with energy and a fair amount of ability will always find a living.

With the numerous new and extended railways, extensive tramway schemes, the widening of streets, sewage works, and such like undertakings, which are now going on and are bound to continue for many years, not to forget the great question of the future—the water supply to our great towns—none of which can be carried out without the Surveyor, I am sure you cannot be wrong in carefully applying your attention to the study of any subjects which may be of value in their application to the variety of work involved. I can hear some saying "Ah! it is all very well for you to talk as one of those who has got there." Well, I can only say I have been through the College and subsequent training, and have little doubt I had a similar thought when at the R.A.C., but that is all the stronger in support of my remarks; because possibly starting with similar views to what some of you may have as to the necessity of all these subjects, I can now see, and have seen for many years, my mistake. The above is only one of various branches, which may be more or less in the mind of the Student when he is considering his future work.

I have written this short article entirely with the view of trying to put before you a very important subject, which I may say never entered my head while a Student, and which it has occurred to me may not have entered the heads of others. If I am misjudging them I can only ask them to forgive me for wasting their time and the space in their valuable paper.

J. H. O.

THE AGRICULTURAL EXODUS.

"It be mighty bad, sir, but I reckon that the next ten years will be worse." Such was my old roadman's opinion of the sharp decline in the population of the parish as shown by the last census returns. One-eighth of the parish had disappeared. Our population, which in 1891 had stood at 857, now stands at 758: so rapid is the exodus of our rural population towards the large towns. This parish, which 30 years ago numbered 1,000, now has sunk to 758. That is 25 per cent., or a quarter of its people gone in 30 years. Yes, my old roadman is right, "It be mighty bad." And there seems no sign of this exodus ceasing. Since the census, other families have gone; one or two each year. What will be left to us ten years hence I do not like to contemplate. This is no isolated instance; the same tale is told of every rural parish and small market town in the district of the Midlands in which I live. In my own parish we may count ourselves fortunate not to have sunk in the same proportion as others further from our county town, for in some purely agricultural villages on the hills behind us the exodus has been indeed terrible, and a neighbouring parson was not exaggerating when he remarked that soon, he thought, he would be left alone to preach to empty pews and visit among deserted houses.

That this parish has not suffered so severely as some is not because the labourers are any more wedded to the land here than elsewhere, but because the London and North Western Railway main line passing through our village many of our men and lads find work upon it, and also being within driving distance of Northampton some shoe work is sent out by manufacturers, who are glad for many reasons to place their work out in the country. But the proportion of men who get their living on the land, or depend upon the land for their support, is small, probably not a third of the working population. Were it not, then, for the two outside sources of employment of labour we should be in as evil a plight as our neighbours.

It is unnecessary for me to point out the great evil of all this, and how harmful it is for the best interests of the country. We all know that it is the country which breeds the best men, the men with the grit and pluck which have built up our Empire. We all know that the space and fresh air to grow in which the country lad has, give him, both in mind and body, an immense advantage over the sickly specimen of humanity bred in the back alleys of our large towns, an advantage which, if he in after life leaves his village for the town, generally brings him to the top. So true is this that I think I am right in saying that out of the last twenty mayors of my county town the majority were bred and born in the country.

If, then, all agree that there is no such serious question affecting the nation at the present time as this of the rural exodus, may we not do well to inquire as to its causes, and as to the possibility, I will not say of curing, for this I believe to be quite impossible, but at least of mitigating the evil. For remember that while this evil is bad for the country as a whole, for agriculture it is simply disastrous. Let the present state of things go on, let the few old men, too old to change their mode of life, and who therefore stay on the land, die out, and in 50 years you will positively be left without labour to carry on farm work. It is only the old men and the boys who now remain. The boys are counting the days to the time that they can get away, and one by one the old men drop out of the running. Who then will be left? Why is it that the British labourer dislikes farm work, is tired of country life, and leaves, as soon as the opportunity comes, the village home of his forefathers? Is it a question of wages? Of course many will say that this is the solution of the whole question. Let the farmers pay their men better, compel landlords to let on the easiest of easy terms small holdings of grass and arable, and the men will then stay. I greatly doubt it. I believe that the reason is not entirely, or in a large part, a question of £ s. d. For I firmly believe, and many who leave the land acknowledge, that though the pay on the land may not be quite so good as at public works or in the shoe trade, yet the opportunities of saving on the land are greater than on the railway, and the work on the land more regular and therefore more profitable in the long run than that most uncertain of all trades, shoemaking.

I am very sure that it is not entirely a question of wages. To my mind it is the idea that has largely got hold of the working classes of our villages that there is something derogatory about farm work, that it is the lowest step in the social scale, that they must try and be a cut above a mere farm labourer, who has wits for nothing but "filling a muck cart." This state of mind is largely brought about by the very unsatisfactory smattering of subjects now taught in our Board Schools, which does not compare at all favourably with the good, old-fashioned, thorough grounding in the three R's and the Church Catechism as taught by the old Voluntary Schools of 30 years ago. It is this sort of sham education for which we poor farmers are rated so heavily; this, because it is not thorough, has given rise to the growth of discontent with the quiet round of honourable employment, and the craze for something new, something exciting. Here, I believe, is the root of a great deal of the mischief. *Work*, because it is *work*, is no longer held up to honour. Neither are they taught how honourable a work is the tilling of the land. Kept at school till the inclination for work leaves them, learning smatterings of subjects only to be forgotten as soon as learnt, the mind, instead of being fed, is only excited, an excitement which bears fruit in after years in despising honest work. Here, then, I believe, is the beginning of the evil, the remedy must lie in real education, in an education suitable for a life on the land, an education which shall teach them to understand and love the wonderful language of nature. This, to my mind, should be the object of every employer of labour in the country, to educate his workmen by his personal influence, showing them what an honourable thing is the manual work of tilling the soil. He should teach them that of agriculture it is especially true, "that if one member suffers the whole body suffers too," and the labourers on a farm are not mere "hands," but rather fellow-workers with the farmer for a common good.

Then, too, to counteract the glitter of the gas lamps, the cheap theatre, the low music hall, which all have an influence in drawing our young men away from the land, I would say educate the minds of your men with healthy amusements: the village club, the village band, social evenings, the dancing class; all can be made to play an important part in the real education of the village lad, in making him love and appreciate his home and loth to leave it.

Writing, then, as I am doing, to many who, in a few years, will be large landowners, farmers, and employers of labour in the country, let me impress upon you the duty, if you would stem the tide of this evil, of throwing yourself heart and soul into the life, the village life, of your labourers. Try to raise them and educate them by your influence and life among them. When all is said and done you will not stem the tide entirely, but my own experience shows me that something can be done to check it. If you only succeed in keeping one or two on the land who otherwise would have left it, it is no exaggeration to say that you are doing a service to the nation, and that you will have done something to help the threatened agriculture of the country.

E. W. Harrison.

REMINISCENCES OF A RESIDENT LAND AGENT.

When after leaving a public school I entered as an In-Student at the R.A.C., now more years ago than I care to remember, my idea was that as a bounteous Providence had somehow omitted to provide me with a landed estate of my own, the next best thing would be to look after some one else's property.

The first thing to be done was to qualify myself for such a position. I therefore went through the R.A.C. course, and finished up by taking the Diploma. Now among the varied subjects taught at the College in my day there was nothing that would assist a budding land agent in effectively superintending the repairs or renewals of buildings on an estate, so on leaving College I went for a couple of years to a builder (not an architect), and helped him at his business generally. We made our own plans for cottages and farm buildings, &c., and bought our own material, as a rule, though we did not object to use stone and timber on any estate on which we were employed, and even bricks and tiles if they were made, but this was seldom. I also helped with the time sheets, and soon got to know when a man was putting in a proper amount of work for his pay, also the task-work rates of the district. We also had larger jobs under architects, contracted for in competition with other builders; one job was a large workhouse, with drainage arrangements which would not be tolerated for a moment in these days, but of course our business was to carry out the architect's specification. Another contract was a gentleman's house, standing in its own grounds, with stabling, &c., in the rear.

I have never regretted the time I put in at this business as I found it most useful in after life.

I then went for a term of five years to a land agent in extensive practice in the Midland Counties. Here I could make myself useful, drawing plans of cottages, farm houses, and buildings, making out the specifications, and superintending their erection, so I began to earn money on my own account, £60 the first year, with a yearly rise of £10 up to £100, but I never got that £100 as you shall hear. We had a variety of estates to look after, some purely agricultural, one with large railway works planted in the centre of it, one in a large manufacturing town, all built upon and with some of the leases just falling in, one in the suburbs just ripe for building, where we had new streets to make and to set out the building lots to the best advantage, and one estate on which coal was being got; altogether a varied lot.

I helped my principal to re-value some of the properties, to take the rents, and otherwise assisted in the general management.

When I had been nearly four years engaged in this business, I got the offer of a resident agency in Yorkshire, which I was advised to accept, and for more than 25 years I had the management of an estate which extended over more than 100 square miles of country, with a rent roll of nearly 1,000 tenants.

We had no very large farms, 350 acres was about the largest, and the bulk of them were about 100 acres or less. The farmers worked with their hired men, who as often as not were the sons of other farmers.

These small holdings stood the brunt of the agricultural depression fairly well, an average drop of 20 per cent. in the rent saw the farms all occupied even in the worst years, and we had a large class of tenants (over 300) whose rents never gave way; these were cowkeepers, keeping a cow and its calf, and a pig or two, and paying from £10 to £12 for a cottage and garden, $1\frac{1}{2}$ to 2 acres of meadow land and a cow-gait (or summer's run) in a large pasture; this system had been in vogue long before the days of Mr. Jesse Collings, and answered admirably. The men worked as labourers either on a farm or elsewhere, and the wives saw to the cow, &c., the man only helping at hay-time and manuring the meadow. This is a system, however, that must be adopted cautiously where the labourer's wife has never had charge of a cow. The labourer's cottage and garden, without land, stood at £4 to £5 a year.

Now there was no architect or clerk of works on this estate, though from time to time we had both, when the mansion was rebuilt, several new churches built, some old ones restored, two shooting boxes enlarged, new parishes made and vicarages built for the new incumbents, but as regards farm houses, buildings, cottages, schools, &c., all the plans and specifications emanated from the estate office, and I felt the benefit of my building experience. My plan was to buy all the building material wholesale, and contract for the labour, and as a result I found I could put up good sound buildings, containing better material than any builder would have used, at a price at least one-third less than he would have charged.

The work on this estate, owing to the number of holdings, was very heavy, and after 25 years of it I decided to retire.

In jotting down these particulars, I have been guided by what I thought might be useful to Students contemplating taking up land agency as a profession. So far as my experience goes, it is a business that demands a lot of practical knowledge, and a good deal of this has to be acquired after leaving College, either at your own or at your employer's expense.

If employers know what they are about they will give a preference to the first arrangement.

I have not touched on the agricultural side of the question as this presented no difficulties. Any diligent student can learn enough both of theory and practice at the R.A.C. to enable him to see that any estate under his charge is properly farmed.

W. G. M. L.

AGRICULTURAL EDUCATION.

Does it exist? Of what does it consist? Of what should it consist? And what has it done so far?

These are questions that I should like to see answered in the *Gazette*. The College is, so far as I know, the oldest institution where the business of teaching Agriculture and its allied sciences has been carried on. Some years since we met to celebrate its Jubilee. Those who have passed out of its gates armed with knowledge have practised its teaching in all parts of the earth; and to them I appeal now for a report from each and every one on the value generally, and the value relatively, of the arms he carried forth.

To Agriculture are allied many sciences, to wit, veterinary surgery, chemistry, botany, geology, mechanics in all its branches, meteorology, surveying, book-keeping, etc.; and in the time that any man can give to the study of Agriculture generally it is hardly possible that he can become proficient in all. What I should like to gather from our Old Students (who, by the way, are the only men really competent to answer the question), is what relative value they individually would assign to each of the allied sciences, and how far in their opinion a student should advance in each, in order to be properly equipped; whether his occupation may have been that of a squatter in Australia, a farmer in Essex, or a land agent on some big estate in England.

The staff of the R.A.C., we may safely admit, has done its best according to its light to provide the youth committed to its charge with the knowledge needed to help it to success in its career. Now is the time to hear from what is left of that youth—grizzled in the head and long in the tooth—how far this effort has been successful, and whether alteration in the teaching given be needed, and if so in what direction that alteration should be. At the present time when a real effort is being made to grapple with Technical Education and to place it on a sound basis throughout the country, sowing the seed in the Elementary School and reaping the crop in the Secondary, I think it will be admitted that in the matter of Agriculture such evidence of experts as I have above suggested might be furnished by Old Students of the R.A.C. would be of the greatest value.

I am quite prepared to admit that each man's answer will probably be biassed by the particular occupation he may have followed or be following, but if he states what that occupation is his evidence will in no way be invalidated by that bias.

I have no doubt that we shall all agree that a certain amount of knowledge of all these subjects ought to be possessed by any man who wishes to have a fair chance of achieving success in Agriculture. Where we may differ is in the relative importance we may attach to each, and the amount of proficiency that should be acquired therein.

Take veterinary surgery for instance, and although all will doubtless admit its vast importance to anyone having to do with live stock of all sorts, and no better evidence of this could be furnished than the admirable lecture by Mr. Woodruff published in the *Gazette* of December last, yet all may not agree as to the position it should occupy amongst the other subjects taught.

How important, again, chemistry is can easily be demonstrated by looking through the analyses of manures and feeding stuffs duly furnished in compliance with Acts of Parliament, and observing the price charged and readily paid for them by the simple and innocent farmer. Also all who have farmed will gladly bear witness to the value which the knowledge of chemistry has been to them almost daily, but all may not be ready for all that to give it the premier place, and very few perhaps be found to hold that a farmer should keep a laboratory and do his own analyses.

And so with the other subjects men would differ, but nothing that I can imagine would be a greater help to those entrusted with the duty of organising the teaching of Agriculture in our schools than the opinions of men who have received a scientific teaching in the subject and put it to the test of practice, and what I would suggest is that the Editor of the *Gazette* invite the same by circular, asking for a per cent. value to be attached to each subject, as well as the reasons for awarding the respective values. To which may be added with advantage a list of those subjects considered most indispensable in the education of children of agricultural labourers and artisans.

I have no means of judging if the Editor will thank me for making such a suggestion, but I am quite sure that were I entrusted with the duty of organising the system and drawing up the syllabus I should be extremely grateful for the information thus gathered to my hand.

H. J. MARSHALL.

[An enquiry, such as Mr. Marshall suggests, as to the comparative value of subjects studied at the College is hardly within the scope or the means of the *Students' Gazette*, and the difference in the forms of work taken up by Old Students would render the comparison of little value. We are always glad, however, to receive articles dealing with the work which Old Students are engaged upon, and the interest is increased if they show how they are helped by the work which they did at the College.—ED.]

THE FEEDING OF HAY TO PIGS.

Whilst farming in America, in West Virginia, some years ago, I carried out some experiments on the above subject.

The feeding and fattening of the pig, or "hog" as he is there called, is a matter of some importance, as outside of poultry one has to rely on him for the meat supply. In the country districts one seldom gets any mutton or beef except in summer time. As soon as cold weather sets in both cattle and sheep lose flesh rapidly, owing to insufficient food and shelter.

The natives have three meals a day, consisting of fried bacon or ham, which they term "meat," hot bread or biscuits, and coffee. Any one working for you, either white or black, if supplied with these three things, day in and day out, will be quite content about his rations, but will immediately make a row if beef or mutton be substituted for the bacon. Mutton, which very few of them will eat at all, is especially objected to. They say they taste the wool, and I can remember once in my own experience "tasting the wool," but the mutton in this case was from a thin sheep.

With regard to pigs, perhaps I had better state here the plan adopted by the average country farmer. The young pigs are usually born in the early spring, March for choice, and allowed to run with the sow till they wean themselves. As a rule they are not kept in sties, but allowed to run in the orchard and surrounding woods, where they pick up what they can, getting nothing extra but the refuse from the house. They soon learn to come readily when called, and this tends to keep them tame. I have known instances where they have run wild, and the owner had then to shoot them with a rifle in the woods, and it took uncommonly good stalking to get near them. In seasons when there is a heavy mast of acorns and chestnuts, &c., it is astonishing how well they will thrive in the woods.

When the weather begins to get cold, say from the middle to end of September, they are taken up and put into sties, or "pens" as they are called, and the fattening process begins. The farmer commences by giving them all the maize (in the cob) that they will eat. The consequence is that they gorge themselves, and after a few days they get feverish and off their feed, and sometimes will not feed again properly for several days. Of course each time this occurs the animals get a check, and the fattening takes longer. They are fed in this manner until fat, when if the weather is cold enough they are killed.

I think it was in a book called *Feeding of Animals*, by Professor Stewart, that I first saw hay suggested as part of the ration for pig feeding. It seemed reasonable: every one knows that pigs will eat grass, clover, &c., then why not hay?

My plan of feeding was somewhat as follows:—Clover hay chopped up fine ($\frac{1}{2}$ inch to 1 inch in length) and moistened, but only sufficiently to make the meal adhere to it; and then maize meal, bran, &c., was added to it, and the whole thoroughly mixed, and fed fresh; no cooking, or leaving the mixture to stand, for in this latter case it would soon turn sour. I have forgotten the quantity of hay and meal used per pig per feed, but I have seen a pig weighing from 150 to 200 lbs. live weight eat half a bushel of the mixture in a very few minutes. The proportion of meal was gradually increased during the fattening process. Hogs ate this mixture greedily, and refused nothing but the coarsest stems. Failing clover I have used both meadow hay and oat straw. They would eat these, but not with the same relish. I have also fed hay in the same manner to young growing pigs with good results. In this case, however, very little maize was fed except in very cold weather, it being too fattening for growing animals.

I found this mode of feeding most satisfactory. The pigs got the full benefit out of the concentrated foods, the particles being divided by the hay. I think I am correct in saying that the pig has a greater length of intestine in proportion to its size than any other of our domestic animals, and consequently can absorb more nourishment from the food supplied. I never had a pig off his feed for a single day, and it is said that pigs fed on hay will not contract "hog cholera," which I believe is the same disease as swine fever.

The foods at my disposal were rather limited. I had to adopt the following rotation of crops:—

1. Wheat, seeded down with timothy and clover or with clover alone. I preferred the latter course, as the clover and timothy do not ripen together.
2. Clover, mown.
3. Maize.
4. Oats.

It was too hot for roots, and the wheat had to be taken after oats, as one could not as a rule plough a field in August except one that had been broken up the previous spring.

Were I to try feeding hay in England, I should prefer pea and bean meal, or crushed oats, to the maize meal, except in cases of fattening.

I may say in conclusion that not one of my neighbours adopted the plan of feeding hay, but went on in the old rut. They would come and look on and see my pigs fed and say it was a "mighty fine trick," but I suppose it was too much like work for them to cut the hay with a hand cutter, and so much easier to throw in a few handfuls of ears of maize.

ALEX. E. MACLEOD.

A NEW ALGA FROM THE BOTANICAL GARDEN, R.A.C.

We notice in a recent issue of the *Journal of Botany* in "Notes on Freshwater Algæ," by W. West and G. S. West, that our Professor of Natural History has discovered a new species amongst *Tolypothrix pygmæa*, in the pond of the Botanic Garden, which is described and figured in the above-named journal. The species is named *Polychætophora lamellosa*, its cells are from 19 to 35 micromillimetres in diameter, and it is thus described. This plant is characterised by the thick lamellose cell-walls, which are furnished on their outer surface with a number of long flexuose bristles. The number of bristles attached to the wall of each individual cell varies from eight to twelve. The bristles are delicate, attenuated to fine points, quite simple, and devoid of sheaths. The cells are sometimes solitary, and there is frequently an unequal development of the cell-wall, a large laminose outgrowth being present on one side. This feature gives almost a stalked appearance to such a cell. More often the cells occur in short irregular filaments of six or eight cells. The chromatophores are bright green and very difficult of observation: they are parietal, but frequently develop large globules of an oily consistency which entirely fill the cell. The presence of this material renders the detection of pyrenoids very difficult.

In the *Journal of Botany* for June, 1902, Professor G. S. West has some notes on Algæ from Hot Springs. The highest temperature at which algæ are said to exist is 94°5 C. (200° F.) observed by Brewer in California. Some specimens from Iceland collected in water at a temperature of 185°F. (85° C.) were examined by the author and were found to consist of *Phormidium angustissimum*, *P. tenue*, and *Mastigocladus laminosus*, all filamentous algæ, along with a few diatoms. Probably this is the highest temperature at which filamentous algæ have been observed.

PRESENTATION TO THE COLLEGE MUSEUM.

Mr. T. A. Scully has kindly presented the College with a varied and useful collection of agricultural produce, obtained from his father's property situated in the Nebraska, Illinois, Kansas, and Missouri States of North America. The collection embraces a great variety of maize of various colours and size, including red, white, black, and yellow popcorn. Some of the specimens are in the cob, others are tastefully arranged in stoppered bottles, while some are still attached to the stalks upon which they grew. The specimens are some of the finest grown in America, and have obtained prizes at the State Agricultural Show of Illinois. There are also samples of Kaffir corn, millet, *sorghum saccharatum*, wheats, barley, oats, hemp, flax, and many other important productions shown as when growing, as well as when prepared for market, and carefully preserved in bottles. Altogether this makes an interesting and valuable addition to the already well-filled museum.

DIPLOMA EXAMINATION AND SCHOLARSHIPS.

In the December examination, 1902, the following gentlemen gained the Honour Diploma of Membership:—G. A. Lambert, E. W. Farwell, and W. H. Crundall. G. A. Lambert gained the Gold Medal. Mr. J. J. Harle, M.R.A.C., of Falfield, Gloucestershire, was the external examiner in practical agriculture.

The three scholarships were divided equally between W. H. Parker, W. W. Bell, and H. S. Mathews.

OLD STUDENTS.

R. B. Astley, M.R.A.C. (1893), formerly agent to Lord Hastings, is now agent to Sir W. Corbett, Acton Reynold, Shrewsbury.

The Rev. Spencer H. Cubitt (R.A.C. 1892-1894, and Captain of Football XV.) has been appointed Commissary to the Bishop of Saskatchewan and Calgary.

OBITUARY.

We regret to record the death of Mr. W. H. Hyne, M.R.A.C. (Haygarth Gold Medallist, 1862), at his Balmoral Sugar Plantation, Mackay, Queensland, on November 19th, aged 65 years. He was a native of Devonshire, and being brought up on a farm, was practically acquainted with all the details of farm work, and being naturally physically strong, possessed the essential character of a successful colonist, for he was himself able to do all the work over which he had control. During his residence at the College he greatly distinguished himself in the various examinations, and in 1863 went out to Queensland, and spent some years gaining practical experience of station life. In 1870 he purchased a sugar estate, and at once devoted all his practical and scientific knowledge to the cultivation of sugar cane and the extraction of sugar, in which he was most successful for many years, and was locally regarded as a high authority on sugar cultivation. In addition to two sugar plantations he owned Fort Cooper, Lake Elphinstone, and another cattle station. The fearful drought of the last four years caused great losses in stock and in the production of sugar, and these conditions naturally exercised a depressing effect upon his genial and cheerful character. His death, which was due to pelvic cellulitis, after a fortnight's illness, caused a feeling of sincere regret in the district in which he had resided for upwards of 35 years, and the deepest sympathy was felt for his widow and family of four daughters and one son. He was a man of high character, upright and honest in all his dealings, and possessed of great energy. Everything he undertook was carried out with a directness and thoroughness which seldom failed to secure the end aimed at. He always cherished grateful recollections of his residence at Cirencester, and anyone who had been connected with the College was always heartily received. The writer, who was a fellow student, retains a vivid recollection of the ten days spent at Balmoral in 1889, and sincerely joins in the regret that a man so useful and so genial should have been called away at the comparatively early age of 65.

J. H.

THE COLLEGE SPORTS.

President.—Rev. J. B. McClellan.
Stewards.—Prof. Kinch, Prof. Paton, Prof. Blundell, J. R. Eddison, G. E. Morrison, W. H. Parker, N. Robinson, T. A. Scully.
Hon. Secs.—H. Middleton, W. D. Stevens.
Judges.—Prof. West, Prof. Wooldridge, E. B. Haygarth, Esq.
Starter.—J. A. Ross Hume, Esq. *Time Keeper.*—Prof. Locke.

The Sports took place on Wednesday and Thursday, April 1st and 2nd.

The arrangements were made by a Sports' Committee consisting of Prof. E. Kinch, G. E. Morrison, W. H. Parker, N. Robinson, and T. A. Scully, with H. Middleton and W. D. Stevens as secretaries ; to these last two gentlemen special thanks are due for their trouble and care, owing to which everything went off without a hitch.

The heavy rain of the preceding week had made the ground very soft and slippery, so much so, in fact, that practising on the track itself had been abandoned in order to keep the ground in something like reasonable condition. Not content with this unpleasant introduction, the weather on the 1st of April was simply horrible. It was too cold to watch the events in comfort, and a drizzling rain was more or less continuous throughout the day. The only redeeming feature in the weather was the abatement of the high wind which had been blowing for some days, for though March came in like a lion, it did not go out like a lamb, in spite of the old saying.

Wednesday's programme opened with the heats for the One Hundred Yards. Gomez won the third heat, F. Scully being second. In each of the other three heats only two competitors started, so that Dobson, Abecasis, Watson, O'Neill, T. Scully, and Ermen merely walked over to qualify for the final.

The next event was the Long Jump, in which there were six competitors, two of whom dropped out almost immediately. Ermen lost a good jump by stepping back in the pit, and he threw away the rest of his chances by taking off much too soon. T. Scully also lost considerably from the same cause in his first three attempts, but he was more successful in his fourth effort, and still further improved his prospects by his fifth jump. O'Neill did well in his second attempt, and in his last jump he succeeded in covering 19 feet, thus beating Scully by one inch.

For the first two heats of the Hurdles only T. Scully and Gomez started, so they merely qualified for the final. The third heat produced a really good race, F. Scully winning and O'Neill gaining second place after being very closely pressed by Ratcliff.

Though twenty-five names had been entered for the Two Hundred Yards Handicap, only nine competitors started in the three heats, thus reducing each race to a walk over. This want of enterprise was a lamentable feature in the first part of the Sports, and it made much of the programme very tedious for the spectators. Only two of the first eleven races on the programme were anything more than a mere formality. It may have been that the depressing state of the weather was in some measure responsible, and it is only fair to say that lack of energy was not observable on the second day of the Sports, but it is to be hoped sincerely that this slackness may be entirely absent next year.

Twelve competitors came to the post for the Open Half-mile. Whitworth came quickly to the front, and maintained the lead till T. Scully passed him in the last half lap. T. Scully won in 2 minutes and $25\frac{2}{5}$ seconds, Whitworth being second, and Henniker third.

The slippery ground appeared to be a great disadvantage to those Throwing the Cricket Ball, making it difficult to run properly up to the mark. For some time F. W. Iredale had the advantage, one of T. Scully's best throws being disallowed owing to his overstepping the mark. F. W. Iredale's throw, however, of 91 yards 5 inches secured the event for him, T. A. Scully gaining second place with 90 yards.

There were two heats for the Semi-final of the One Hundred Yards. In the first, O'Neill won, in spite of looking round, in 11 seconds, Watson being second, whilst in the second heat T. Scully reached the tape in $11\frac{1}{5}$ seconds, with Gomez next.

In Putting the Weight, T. A. Scully nearly equalled the best of O'Neill's performances, till the latter in one of his last attempts made a put of 29 feet 9 inches, thus winning from T. A. Scully by 4 inches.

The track was in very bad condition for the Three Mile Race, for which fifteen competitors faced the starter. Henniker soon came to the front, and going with a splendid stride he covered the distance in 17 minutes and 56 seconds. The ground could hardly have been more slippery, and this was especially troublesome at the curves of the track. Ratcliff looked like gaining the second place, but he was passed by Whitworth after a tremendous sprint down the last hundred yards.

The first day's programme ended with the heats for the Bicycle Egg and Spoon Race, and those for the Three-Legged Race, and the Races for the College and Farm servants.

Thursday morning revealed a welcome change in the weather, the day being bright and fine though cold. The track had been reduced to a swamp, so it was moved entirely about two feet up the field.

In the morning the Quarter Mile was won by T. A. Scully in $59\frac{2}{5}$ seconds, F. Scully being second, and Watson third.

About twelve started in the Walking Race. Eddison walked the two miles in 19 minutes and 20 seconds, thus improving on his last year's time by 23 seconds. W. W. Bell came in second, a quarter of a lap behind Eddison, and not more than 10 yards in front of E. A. Iredale, who secured the third place.

After the interval T. A. Scully threw the hammer 86 feet 2 inches, thus winning easily. Parker was second with 68 feet 3 inches.

F. Scully won the final Hurdle Race easily in 20 seconds. O'Neill and T. Scully being second and third.

The Mile Race brought out about half of the twenty-five who had entered for it. Henniker finished in 5 minutes and 18$\frac{4}{5}$ seconds. Whitworth gained on him rapidly at the beginning of the second lap, but fell back again up the hill; he beat Browne for the second place with plenty to spare.

There was a large entry for the Sack Race, but most of the competitors remained scattered about the ground on their backs. Of those who finished, W. W. Bell was first and F. Scully second.

The High Jump did not produce any brilliant result, O'Neill winning when he cleared 4 feet 11 inches. As a matter of fact, however, he jumped with quite three inches to spare above the bar. Ermen was second, clearing 4 feet 10 inches.

There was a very close race for the first three places in the final of the Hundred Yards, the order being O'Neill, T. A. Scully, Watson, and the time 10$\frac{3}{5}$ seconds.

The final Bicycle Egg and Spoon Race was well worth watching. Nubar went in great style for half a lap, till he lost control of his mount and ran out of the course altogether. F. Scully gave a striking performance with his free-wheel, but he fell off in the second lap. By this time all the competitors but two had come to grief. The survivors raced neck and neck to the finish, Mankowski winning and Eddison securing the second place.

O'Neill with 10 yards start won the Two Hundred Yards Handicap, in 20$\frac{3}{5}$ seconds. Gomez with 18 yards start just managed to beat Watson, whose start was 8 yards.

The Three-Legged Race was won by T. A. Scully and Jung; they were very unevenly matched in point of size, but this enabled Scully to swing his partner along in a style which made one long to see him in the ball-room. F. Scully and Dobson came in second.

In the Half Mile Handicap Dobson, the limit man of those actually starting, made the pace pretty hot for more than a lap, when he was passed by Browne, but pluckily sticking to his man, Dobson drew ahead again in the last half lap and won comfortably by about 4 yards, Henniker managing to obtain a somewhat distant third from scratch.

In the Tug of War the In-Students' team was captained by Ratcliff, and the Out-Students were led by T. A. Scully. It was truly a contest between eight Davids and eight Goliaths, but the end of the contest was very different from that of its ancient prototype. Nevertheless, the first pull was a long one, and for some time it was impossible to say which side would be victorious. However, the enormous dead weight of their opponents proved too much for the lighter team, and the Out-Students gained both the first and the second Tugs.

The Consolation Race was won by Sherston, Cooke being second and Brigstocke third.

The Medal for the winner of the greatest number of marks was won by T. A. Scully by his all-round excellence, winning three first places and four seconds; he was very closely followed by O'Neill, who was first in four open events and second in one, whilst the latter also won one of the handicaps. The long distance Cups were easily annexed by Henniker, who won both the Mile and Three Mile Races somewhat easily; whilst the Jumps' Cup went to O'Neill, who was first in the Long and High Jumps and second over the Hurdles.

Jung won the Donkey Race, Obeyesekare's mount coming in second. The Costume prize was awarded to Symons for a dress which showed both taste and skill. F. Scully, too, must be commended for his very original costume.

The Special Race Card for the Donkey Race is reproduced below:—

THE APRIL H'OAKS STAKES.

Open to R.A.C. Students (married or otherwise).
Distance: The same old course (nothing new).
No Spurs or Panniers allowed.
Pace not to exceed 30 miles per hour.
ADVICE TO RIDERS ... ... KEEP SMILING.

PROBABLE STARTERS.

Owner.	*Donkey.*	*Costume.*
Mr. GRANT'S	"Lu-Lu"	Jockey

"Down the street you see me stride,
Often too a "trunk" I'll ride;
Now in colours all aglow,
I intend to win this show."
Sporting Notes.

Owner.	*Donkey.*	*Costume.*
Mr. O'NEILL'S	"Shamrock"	Rajah

"We have heard of the Rajah of Bon,
And the land of the Emerald Isle;
But a mixture like this so *bon ton*
Would make e'en an Irishman smile."
Irish Mail.

Owner.	*Donkey.*	*Costume.*
Mr. STAVROULOPOULOS'	"Spartan"	Greek

"A haughty Greek joins in the race,
We doubt if he will get a place;
If confidence and cheek may win,
First past the post he will get in."
Daily Excuse.

Owner.	*Donkey.*	*Costume.*
Mr. JUNG'S	"Harem"	Native of India

"A man from India's coral strand,
Rides round the course in splendour grand;
Although his mount is but a "Moke,"
He seems to quite enjoy the joke."
Bombay Monthly.

Mr. Symons' "Pons Asinorum" Bridge

"Exponent of the Noble Game and player of P.T.*
If you can only mount the bridge, then Bridge will mounted be."
Sporting Rag.

* A game of very ancient origin, played in Pre-historic times and corresponding somewhat to Parlour Tennis.—Ed.

Mr. F. Scully's "Neurectomy" P. M. Subject

"Surely now this Moke's escaped from out the P.M. shed,
Quick call the Vet. and Terry too, and knock him on the head."
McSquashe's Veterinary.

Mr. Obeysekare's "Wrangler" Doctor of Divinity

"A D.D. in a Donkey Race is not a common sight;
Did you say D. or a D.D.? what! do I hear you right?"
Varsity Echo.

Mr. T. A. Scully's "Windjammer" Jack Tar

"Let out a reef, don't let her jib, hold tight, pull in the slack,
It's not a bad plan in this game to stay upon her back."
Navy Notes.

Mr Henniker's "Suffolk" Punch

"Oh! mother have you seen our mule,
He takes to biting as a rule,
At jumping too, he's like a goat,
He's nipped the bottom of my coat."
Weekly Jottings.

Latest from the Man on the Spot.

"Post Mortem Subject" is for sale.
"Shamrock" has had too much green food.
"Pons Asinorum" is no good at the water jump.
"Harem" a stayer but rather Scarem.
"Wrangler" can keep it up indefinitely.
"Windjammer" has been entered as a quadruped, but can be transformed into a sexiped.

N.B.—No outside interference or assistance is allowed. Competitors receiving any help are disqualified and must immediately retire from the course.

Visitors are particularly requested to keep off the course.

IMPROBABLE STARTERS.

Prof. West's "My Blushing Rosey" out of "Lamellibranchiata" by "The Waddler."
Prof. Paton's "Bold Front" out of "Waistcoat" by "Expansion."
Prof. Blundell's "Hayseed," roughly speaking is 5 to 20 years too old for racing.
Prof. Wooldridge's "Week End" has returned, but in too sorry a plight to run.
Prof. Locke's "Puff Puff" has got stuck on the way in Plastic Matter.
Mr. Waller's "Substitute" is a long-winded animal.
Mr. Antimacassar's "Stripes" astonished his backers (8 to 1 on) by coming to grief after a fair trial.
Mr. Robinson's "Jessica" has a bad cold in the Head.
Mr. Husain's "Barbarian" too dangerous to let loose.
Mr. Kay's "Alpha" has got pace, but liable to break down on the whey.
Mr. Sherston's "Hairtrunk" has been recently exchanged by owner for a hobby-horse.
Mr. May's "Tête-à-Tête"; a fast filly well over 15 hands, is training in the Park.

Mr. Bell's "Spot Barred" has not yet been caught napping.

Prof. Row-Locke's "Tatcho" has come on wonderfully within the last few months, but badly wants clipping.

Mr. Abecasis' "Stage fright" will not face the music unless the police keep good order.

Mr. Cox's "Entertainment" cannot stay the course after a heavy feed of peas.

Mr. Terry's "Angora" has caught a chill due to change of coats, so is not allowed out.

Fifty-eight Students had entitled themselves to compete in all events, and support of a somewhat different nature was afforded by the presence of a goodly number of visitors. The band of the 4th Batt. Gloucestershire Regiment played during the second afternoon.

The thanks of the College are due to Miss Haygarth, who distributed the prizes.

PLOUGHING COMPETITION.

This event came off this term in No. 11, resulting in George and Vickers being placed equal for the prize, R. Adderley and Stavroulopoulos being highly commended, while Parker, Stevens, Abecasis, and Gomez were sufficiently meritorious to "pass."

FOOTBALL.

RUGBY.

R.A.C. v. Naunton Park.—This match was played at Cheltenham on Saturday, February 21st. The College won the toss, and started playing down the hill with a strong wind behind them, and for a time play settled down in their opponents' part of the field. Naunton Park, however, soon obtained the ball from a bad pass, and after a little combination Pruen scored their first try behind the posts. The try was converted. After the kick-off the College pressed for some time, and once Skelsey got past all but their back. Score at half-time, 8—0. After half-time, with the wind and hill in their favour, Naunton kept the College on the defensive most of the time. They obtained four more tries, two of which were converted. Just before time the College forwards got together and the ball was taken into the Naunton 25. Bell dribbled the ball over their goal line but was just too late to touch it down. Naunton Park were thus left winners by 24 points to *nil*. For the College, Skelsey at half, E. A. Iredale, Ratcliff, F. W. Iredale, and Cox at forward, played well. Team :—J. Deane, back ; C. A. Cooke, W. D. Watson, W. H. Parker, R. C. Mankowski, three-quarters ; D. H. Skelsey, G. M. Dobson, halves ; E. A. Iredale, R. A. Ratcliff, T. W. Davies, H. G. Browne, H. C. Bell, F. W. Iredale, G. C. Cox, E. W. Amsden, forwards.

R.A.C. v. Stroud.—Played March 7th, at Stroud. For about ten minutes the play was fairly even, but after that Stroud scored fast. Their passing was very sure and they almost invariably got the ball in the scrum. The game was one long series of defensive play for the College. On two occasions Skelsey got well away but was not backed up, so that nothing resulted. Stroud thus won easily by 50 points to *nil*. Team :—Deane, back ; Mankowski, Parker, Watson, T. A. Worsey, three-quarters ; Skelsey, Dobson, halves ; E. A. Iredale, Ratcliff, Davies, Browne, Bell, Cox, Amsden, Jung, forwards.

R.A.C. v. St. Paul's College.—Played March 14th, on our ground. For some time play was fairly even, but after about ten minutes their captain obtained the ball, and being badly missed by our back scored in the corner. The try was not improved upon. St. Paul's scored three more tries before half-time, the score then being 16—0. During the second half we had more of the game; the forwards played very well, being very good with their feet in the open. At one time the ball was within a yard of their goal line for about five minutes yet we failed to score. From a mark F. W. Iredale made a very good attempt at goal, the ball striking the post above the bar. St. Paul's added 13 more points to their half-time score, thus winning by 29 points to *nil*. The whole team played up better than they had in previous matches. Team:—Parker, back; Cooke, Browne, Watson. Mankowski, three-quarters; Skelsey, Dobson, halves; E. A. Iredale, Ratcliff, Davies, H. C. Bell, F. W. Iredale, Cox, Deane, Amsden, forwards.

ASSOCIATION.

R.A.C. v. Cirencester Town.—This match was played on February 28th on the Town ground in the park, and resulted in a win for the College, 2 goals to 1. The R.A.C. got together a scratch team to play this fixture, the only association match of the year. The R.A.C. won the toss and elected to play with the wind; the first half may be described as a continual peppering of the Town's goal with very bad shots. More than once our forwards had only the goal keeper to contend with but failed to score. They however not only proved themselves to have more dash but continually outpaced their rivals. O'Neill with a low shot along the ground was the first to score for the College, and was quickly followed by F. Scully. At half-time the College led by 2 goals to 0. The game after this was of rather a more even character, the Town managing to score a goal five minutes before time, and the College frequently looking dangerous. Prof. Wooldridge and Parker at back put in some very useful work, and the combination of the left wing, O'Neill and Skelsey, was really surprising considering the little practice they had had on the Rugby ground with Rugby goals. The score, 2 goals to 1 in favour of the College, should have been considerably more had it not been for the atrocious shooting of the forwards. This, however, was only to be expected as most of them had not touched a socker ball this winter. Team: Goal, H. C. Bell; backs, G. H. Wooldridge and W. H. Parker; halves, R. C. Mankowski, H. Jung, F. Needham; forwards, J. O'Neill, D. H. Skelsey, F. Scully, W. W. Bell, T. A. Scully.

GOLF.

The match between the R.A.C. and Sapperton Park clubs was played at the R.A.C. on Wednesday, February 25th, in very breezy weather, and resulted in a victory for the home team by 17 holes.

R.A.C.		Sapperton Park.	
E. B. Haygarth	0	J. Rawlins	0
Prof. Paton	0	E. C. Cripps	3
Prof. Blundell	3	E. C. Sewell	0
Prof. Locke	5	H. St. G. Rawlins	0
G. E. Morrison	2	R. J. Mullings	0
E. C. Villiers	0	G. P. Smith	2
Prof. Wooldridge	5	W. H. Cole	0
Prof. West	7	Rev. T. F. Burra	0
	22		5

The American Singles Competition was won by Prof. Wooldridge with 18 points. L. Hewett was second with 16 points.

The Foursomes Competition was won by G. E. Morrison and W. W. Bell, who, in the final, beat Prof. Wooldridge and J. Henniker 7 up and 6 to play.

Senior Cup.—This was won by Prof. Wooldridge with a magnificent 87 — 6 = 81. The weather was very boisterous, and no other respectable score was returned.

	Gross.		Hcp.		Nett.
Prof. Wooldridge	87	–	6	=	81
Prof. West	96	–	7	=	89
Prof. Blundell	95	–	4	=	91
G. E. Morrison	107	–	10	=	97
H. T. Watson	108	–	9	=	99

JUNIOR CUP.—This was won by C. E. A. Ermen, who did a very good round.

	Gross.		Hcp.		Nett.
C. E. A. Ermen	101	–	30	=	71
H. C. Bell	120	–	28	=	92
J. Cullen	126	–	33	=	93

No other returns were made.

R.A.C. BEAGLES.

Masters.—J. CALDER, V. S. S. VICKERS. *Huntsmen.*—J. CALDER, N. ROBINSON.
First Whip.—V. S. S. VICKERS. *Second Whip.*—G. SYMONS.

This pack consisting to commence with of 10 couples of hounds, averaging 15 to 16 inches in height and level in appearance, was got together by the combined efforts of Messrs. Calder and Vickers during the summer vacation, their advent at the beginning of the winter term being welcomed by all the sporting section of the R.A.C., as there had not been any beagles here since G. G. Gunter hunted a pack in the winter of 1899. They have hunted fairly regularly throughout the season, the weather being for the most part open, and not more than two fixtures being postponed on account of frost. Although handicapped by a change of huntsmen towards the end of the winter term—J. Calder being unavoidably obliged to give them up and hand over the horn to N. Robinson, who has successfully hunted them up to the end of the season,—all those concerned in their management may congratulate themselves on the excellent sport shown by these hounds, which have afforded exercise and diversion for so many. Since they were started several alterations have been made in the composition of the pack, and they have been reduced to 8½ couple. They hunt very well together, and are under better control and in better condition than formerly, standing a hard day's work well. Also, they have more than once given evidence of a fine turn of speed when piloted by a hare of the right sort, by running clean away from "the field." Hares have on some occasions been more than plentiful, but where present in the proper proportion good sport has always ensued. Hounds have accounted for nine hares in all.

Some of the best days during the Winter Session were :—At Mr. Scott's farm at Kilkenny, at Mr. Crewdson's at Syde, and at Dowdeswell, by the invitation of the late Mr. Part. At the last-named place two hares were accounted for after two first-rate runs of 65 minutes and 55 minutes respectively, there being another good run besides. This was a very hard day for hounds and field, as that part of the country is very hilly and the hares stout.

Some of the best meets during the past term have been at Down Ampney, Bibury Court, Shipton Oliffe, Mr. Hobbs' of Maisey Hampton, and Trewsbury Park. At Trewsbury Park we enjoyed excellent sport, scent being very good, and hounds were able to make the pace a cracker, and ran into two hares after good sharp runs.

On Saturday, April 4th, to finish the season we had a day on the College Farm, by the kind invitation of Mr. Swanwick; this resulted in a very fast burst of about 15 minutes to start with, when puss took to the Park and complications ensued; our day closed with a very fast and comparatively straight burst which commenced, after two or three preliminary rings in No. 18, out to the Tetbury road and then to Trewsbury Park, where there was a change of hares. Fields have ruled small for the most part, but the most consistent members have been Messrs. Sherston, Henniker, Ratcliff, Sparrow, T. and F. Scully, Fagan, Stockwell, Eddison, and E. A. Iredale. The masters, huntsman, and whips have earned hearty thanks for their work in the field, but perhaps even more for the untiring energy with which they have attended to the general management of the pack and the arrangements for hunting. Last but not least, the thanks of all beaglers are due to those who have been so kind as to give them leave to hunt over their land and who have provided hares and refreshments for their diversion.

BILLIARDS.

An American Tournament Handicap, 200 up, was played off during the session between the following competitors:—

Prof. Paton	scr.	Gomez	75	Villiers	80
Prof. Locke	10	O'Neill	75	Davies	85
Prof. West	10	Skelsey	75	Adderley	90
Prof. Wooldridge	60	Cossio	80	Stevens	90
Mankowski	65	Brown	80	Dobson	100
Middleton	65	Jung	80	Stavroulopoulos	110
Worsey	65	Solignac	80		

First prize, Worsey; second prize, Mankowski; third prize, Gomez.

REVIEWS.

CULTURE OF VEGETABLES, FOR PRIZES, PLEASURE, AND PROFIT. By E. K. Toogood. Southampton: Toogood & Sons. 1902. pp. 144. 3d.

This is a re-publication of a clear, concise, and commendable little book well worth the modest sum, which is its actual cost price, asked for it.

THE CHEMISTRY OF THE FARM. By R. Warington, F.R.S. Fifteenth Edition. London: Vinton & Co. 1902. 8vo. pp. viii. and 253. Price, 2/6.

We welcome with much pleasure the appearance of this revised edition of the best known and best written small handbook of Agricultural Chemistry. "The Chemistry of the Farm" has been translated into many languages, and is appreciated in foreign countries almost as much as in this land. It has now reached its majority, the first edition having been published in 1881, and it has doubled in size since its birth, but, we are thankful to say, still remains within reasonable dimensions. In the present revision the number of pages has gone up from 191 to 253, and practically the whole of the increase is in the chapters relating to Animal Nutrition, which occupy more than half the volume. The additions and alterations have been rendered necessary by the work done on the continent and specially by the work in Germany of Zuntz and Hagemann on the nutrition of the horse, and of Kellner and his collaborateurs on the nutrition of the ox. A new short chapter on "Nutrition in terms of energy" has been introduced. As a masterpiece of clearness, conciseness, and accuracy this little book is unrivalled, and the talented author has well kept up his reputation. The only ambiguity we have noticed being in relation to the composition of fallen forest leaves in paragraphs on pages 18 and 81. No student of agricultural chemistry or of advanced agriculture can afford to be without this small but precious volume.

RESULTS OF INVESTIGATIONS ON THE ROTHAMSTED SOILS. By Bernard Dyer, D.Sc. Washington: United States Department of Agriculture. 1902. pp. 180.

These are the reports of the Lectures delivered under the provisions of the Lawes Agricultural Trust in November, 1900, before the Association of American Agricultural Colleges and Experiment Stations at Newhaven and Middletown, Connecticut. The previous lectures given in the United States under this Trust, which have been published, are those by Prof. R. Warington in 1891 and by Sir J. H. Gilbert in 1893; the bulletins, published by the Office of Experiment Stations, comprising these are both out of print. These lectures were delivered shortly after the death of Sir John Lawes, and were not published until after the death of Sir J. H. Gilbert, whose assistance to Dr. Dyer in preparing and arranging these lectures was unsparingly given and is thankfully acknowledged. The greater bulk of the report—about 130 pages—is necessarily taken up with the results of investigations on the Broadbalk wheat soils of which samples were taken in 1865, in 1881, and in 1893, after wheat had been grown continuously for twenty-two, thirty-eight, and fifty years on each plot: the wheat recently sown on Broadbalk will be that of the sixtieth year in succession of the crop. Some of the results have been previously published, but a large part of the matter contained in the lectures is new. The results of Dyer's investigations into the nature of the phosphoric acid and potash contents of the soils on the plots of wheat in Broadbalk and on the plots of barley in Hoos Field are of course incorporated. One of the most interesting and striking results pointed out is the accumulation of nitrogen on a barley plot which receives no nitrogenous manure owing to the persistent luxuriance of *Medicago lupulina* growing as a weed on a plot receiving a good supply of mixed cinereal manures. For the collection of this mass of useful information, its careful editing, and publication the agricultural world is indebted not only to Dr. Dyer, but to the late Sir J. H. Gilbert for his aid, to the late Sir John Lawes for the provisions of the Trust, and to the United States Department of Agriculture for the publication and for certain unaccustomed spelling.

INTRODUCTION TO SCIENTIFIC CHEMISTRY. By Dr. Lassar-Cohn, from the German by M. M. Pattison Muir. London: H. Grevel & Co. 1903. 8vo. pp. viii., 348. Price 3/6.

This little introduction to Chemistry, by the Professor of Chemistry at the University of Königsberg, is in the form of popular lectures for beginners. Though presenting the subject on scientific lines, it is made as popular as is possible; the author has had experience in this method of treatment of the subject, and has been fairly successful in his attempts. Compare his excellent work on "Chemistry in Daily Life"; done into English by the same translator and publisher as this book. Anyone taking a serious interest in chemistry will be able to learn from this book, and it would be well if such a book were read by students before they took up the subject in a more detailed and purely systematic manner. The pages relating to carbon compounds are particularly good. Being in the form of lectures the use of the pronoun *we* is rather frequent—unnecessarily so—thus, opening the book at pages 80, 81, we find that *we* occurs no less than nine times on each page, and its possessive form more than once. The translator might have diminished this little blemish.

UNIVERSITY of ILLINOIS
JUL 15 1942
PER. DUPS.
COPIES

NEW SERIES.
Vol. XI. Part 4.
AUGUST, 1903.
Price 1s.

AGRICULTURAL STUDENTS' GAZETTE.

EDITED BY

STUDENTS AT THE ROYAL AGRICULTURAL COLLEGE,
CIRENCESTER.

CONTENTS.

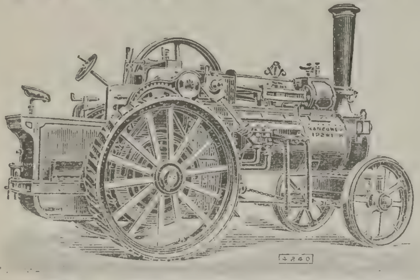
	PAGE
HINTS ON THE PREPARATION OF ANIMALS FOR SHOW. By M.R.A.C.	99
EXPERIMENTS ON PASTURE, 1903. E. K.	103
NOTES ON CAPE FARMING. M. G. Godlonton, M.R.A.C.	106
FARMERS AND CO-OPERATION. Edwin Smithells... ...	108
SOME AGRICULTURAL METHODS. A MONTENEGRIN SKETCH. Frank Savile...	112
SOME WILD FOWL SEEN IN SHROPSHIRE. Beville Stanier, M.R.A.C., F.Z.S.	115
FARMING IN NORMANDY. Edward Blundell ...	118
THE ROYAL AGRICULTURAL COLLEGE CLUB	121
FARM NOTES	123
DIPLOMA EXAMINATION ...	123
OLD STUDENTS	123
HONORARY PROFESSORSHIP ...	123
CHLORINE IN RAIN WATER. E. K.	124
EXAMINATION OF THE SURVEYORS' INSTITUTION ...	124
THE THAMES	124
CRICKET	124
LAWN TENNIS	129

ALL RIGHTS RESERVED.

CIRENCESTER: ALFRED T. HARMER, MARKET PLACE.

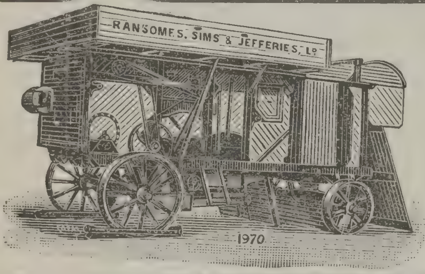
APPOINTED BY ROYAL WARRANT MANUFACTURERS OF AGRICULTURAL MACHINERY
TO HIS MAJESTY KING EDWARD VII

RANSOMES, SIMS & JEFFERIES, Lᴰ.



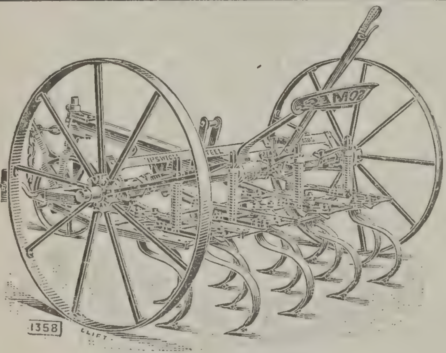
MANUFACTURE THE BEST
TRACTION ENGINES,
PORTABLE ENGINES,
VERTICAL ENGINES,
HORIZONTAL ENGINES
AND BOILERS.

Excellent designs, first-class materials and workmanship; ample strength in all working parts; large bearings and cylinders; ample steam space.



FINISHING
STEAM THRASHING MACHINES.

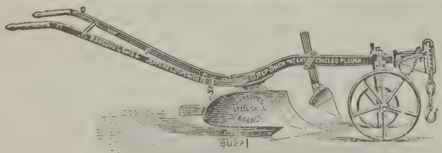
R., S. & J. have supplied Thrashing Machines to HIS MAJESTY THE KING, for the Sandringham Estate, and to the late QUEEN VICTORIA, for the Prince Consort's Shaw Farm, Windsor.



"THE IPSWICH"
STEEL CULTIVATOR.

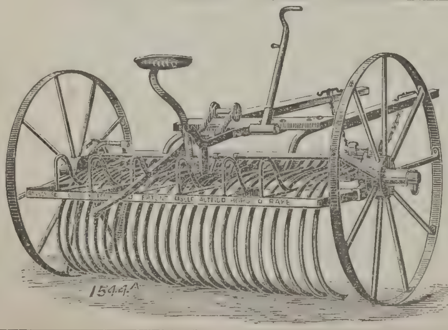
The strongest, best, and most perfect Machine in the market. The spring of the teeth keeps everything alive. Can be fitted for two or three horses.

Also
"SMALL HOLDINGS" and
"TRIPLEX" CULTIVATORS.



IRON AND WOOD PLOUGHS,
2 AND 3 FURROW PLOUGHS,
CHILLED DIGGING PLOUGHS.

R., S. & J., Ld., have been manufacturers of Ploughs for nearly a century, and the Chilled Plough Share was invented by Robert Ransome in 1803.



NEW "G.M.C." GENERAL PURPOSE RAKES.
THROUGH AXLE RAKES.
SELF-ACTING & MANUAL RAKES.
HAYMAKERS.
SWATHERS, &c.

◆ ◆ ◆

FULL ILLUSTRATED CATALOGUES
FREE BY POST ON APPLICATION.

◆ ◆ ◆

ORWELL WORKS, IPSWICH.

NEW SERIES.

Agricultural Students' Gazette.

Vol. XI. AUGUST, 1903. No. 4.

HINTS ON THE PREPARATION OF ANIMALS FOR SHOW.

By M.R.A.C.

A noted breeder of Devon cattle was once asked how he brought his animals to such perfection. He replied, "by grinding sovereigns for them." No doubt there is a certain amount of truth in the observation, but it is not such a serious outlay as that. Given a selected beast, a good stockman, and suitable accommodation, the matter of feeding depends, in the writer's opinion, more upon an animal's adaptability to fatten than upon albuminoid ratios. On several occasions he has put up beasts of the same breed and age in pairs and the daily gain has differed as much as ·8 to ·9 lbs. on exactly the same rations; and yet, in the extreme case cited, both animals won prizes. These facts are to say the least of it annoying and perplexing, but it is not to be expected that all animals will do exactly alike, and the old proverb that "what is one man's meat is another man's poison" applies equally well to cattle. In selecting a beast several points must be taken into consideration, and choice depends a good deal upon whether your animal is to be prepared for an under-two-year-old class, an under-three-year-old class, or whether he is to appear in the show yard two consecutive years.

CHOICE OF ANIMAL.

If you wish to have all the honour and glory let the beast be one of your own breeding. There is more honest satisfaction in securing barren honours with a home-bred than in taking a prize with a purchased beast. If, however, you see a suitable animal in the open market and can buy it at beef price, do so by all means and back your judgment, but never, never give a fancy price to anyone. The breeder only laughs in his sleeve, and inwardly pours his benedictions on you for advertising him. Length of purse can buy prizes ahead, and now-a-days ninety-nine men out of a hundred are only too glad to avail themselves of the opportunity of supplying pot hunters with what they require at exorbitant prices. It is, perhaps, fortunate such people are to be found to give the farmer an occasional "leg-up."

For the under-two-year-old class let your animal be true to his kind —if pure-bred—and have all points as laid down by the herd book. Should you purchase or breed a calf keep it as long as possible with the dam. Calf flesh is everything and must never be lost. The earlier in the year a calf is born the better, but in severe weather they may get a check, and a March born one will often prove the best in the long run. Fine and short bone must be looked for. Reject an animal with no promise of a second thigh.

For the under-three-year-old class a too finely-bred animal is not so desirable, and a larger frame and heavier bone should be sought for. There is a saying that "a calf grows to his head," and it is very true. A calf somewhat coarse in appearance will frequently turn out better than one more fairly bred. Beware of legginess. You cannot have an animal too close to the ground. Also remember that as a heavy weight has to be borne by a beast in this class, unless there is plenty of bone to start with he will be certain to break down on his feet. Again, a finely-bred animal will often fatten rapidly to a certain point and there stop, whereas a large-framed animal will usually grow to a large size before commencing to fatten to any extent.

Never let several strong points induce you to try experiments if there is one apparent bad fault. The good points will probably continue good, but the bad one will become more glaring every week. A perfect top and underline are essential. There must be no semblance of patchiness at tail head, or elsewhere. The legs should be well outside the body. The broader the forearms the better. The skin must be like silk, and you should be able to grasp a good handful over the ribs. A hard-skinned beast may be rejected without further consideration. The width across the hook bones and from the centre of this imaginary line to tail head should be about the same.

People differ in opinion as to when to castrate, but you are fairly safe if is this done between the third and sixth month. If done too early the shock is more than some calves can bear without going back, and if left too long a coarse head may result.

FEEDING.

The following is the recipe for the ration which is a proved good one, and is largely used by many prominent American breeders, as well as by one of the most successful exhibitors in England in recent years. For each 1,000lbs. live weight give a mixture made up in following proportions. Four parts each by weight of wheat, barley, oat and maize meal. Four parts each by weight of bran, hay chaff, and pulped roots. Two parts each by weight of pea meal and bean meal. Also one part by weight of linseed jelly. Mind it is jelly, and not merely swelled linseed. Every grain should have burst. Let the animal have 1lb. of treacle daily mixed with his drinking water, which should never be given cold and only at intervals. Do not water after meals or much food will get washed out of the stomach. Rock salt should always be handy, and Thorley's Food at the rate of a packet a day may be given with benefit.

The corn rations as above should be well mixed up and given at different times to the chaff and roots, while the jelly can be divided up into two lots and be mixed with the hay. The meals should be at least six in number, the first one being given as early as convenient and the last one as late as possible at night. During summer some withered vetches or white roots can be given with advantage, and will help to keep the animal cool.

A few months before the show season stop all treacle, and in place thereof give a *hot* supper composed of half a pint or more of lentils, half a pint of oatmeal, and another pint of linseed jelly, all boiled up together and poured over a double handful of hay chaff. If the animal won't move on this feeding nothing will make him. 2·2 lbs. to 2·68 lbs. may be put on daily by a beast which is a good doer.

STOCKMEN.

A good stockman is born and not made. He must naturally be fond of live stock, and be gentle and patient with them to a degree. Such a man will notice every little peculiarity of animals under his charge. He must be regular in his attendance on them, and should remove all stale food from the mangers. In hot weather he should sponge the animals over occasionally, and hang wet sacks over their windows. All bedding must be shaken up and droppings removed regularly, as if allowed to accumulate unduly will result in hot feet. Quietness is also essential, and it is wonderful how an animal appreciates being talked to and petted. A show beast is like a baby, and wants as much attention. Let the stockman know his efforts are appreciated. A promise of a percentage of the prize money if won will often work miracles. Always mix your rations yourself. The average stockman cannot be expected to understand the value of albuminoid ratios, and may make serious blunders.

GENERAL HINTS.

Pay regular attention to the feet, and have them trimmed and pared when necessary. A little daily exercise on a hard road will go a long way to keep them in order, but before leading the animal out walk him a few times round the yard or on some turf, or he may throw himself down. If any paring is necessary, a blacksmith will do what is required for a few pence. After being attended to once or twice the animal will stand still. A paring knife, hammer, chisel, and rasp are all the tools required, and there is no necessity to cast an animal.

During the whole fatting period washing must not be forgotten, and for some weeks previous to the show the beast must be groomed daily. To get rid of any lice and to bring off scurf, the following method is a good one : Take four ounces of strong cheap tobacco and pour about a gallon and a half of boiling water over it and stir well about. When cold, thoroughly saturate the animal's coat, choosing a warm day for the operation. Next day brush him well all over, and rub him down with a wisp of straw. Continue to do this daily, as it makes the skin soft, and for polishing the hair there is nothing like elbow grease. Never use a curry comb. The nearer the show day the more is the attention required. Daily washing with soft soap and water is necessary, and the hair should afterwards be brushed upwards and crossways. There is nothing judges like more than a good coat. The plan of putting cloths on the animal for a few weeks is a good one, as it brings the coat up quickly and helps to keep it clean.

Daily exercise must be given or the animal will never show himself off to advantage. A few minutes, too, should be spent in teaching him to stand properly. If it is found his back is too high feed in future from a high bin, if saggy feed from a tub on the ground.

Horned animals must be haltered and have their horns well polished. Sand paper followed by emery paper is recommended by many, but the writer has found that a strong knife with the blade held at a little less than a right angle to the horn and drawn along the curves, from base to the tip, is a far quicker way. Emery paper may be used to finish off with, and a final polish with oil is all that is required. The hoofs and clams must also be well cleaned and polished as much as possible.

TRANSIT TO SHOW.

Never let the animal walk a yard if it can be helped. If not too far have him carted from his box to show direct. If the journey is by train, cart him to the station and have him met at other end. Not a pound weight more than necessary must be lost. Animals travelling from a distance are at a great disadvantage, owing to the fact that they are weighed on entry into the show yard. Those from a short distance naturally waste less, and it is obviously an unfair system. Every animal should be put on the weighbridge under the same conditions, and so long as the animal is weighed before a certain hour it could not possibly give the stewards much extra trouble. The difference between fasted live weight and ordinary live weight may mean, after a long journey, nearly one cwt. on a large animal, and a butcher looks at and buys on the published weights.

JUDGING MORNING.

Your stockman should not leave his animal for a minute until after the judging. Every possible finishing touch must be given to the animal. The hair must be brought up with an iron comb, and the squarer your exhibit can be made to look the better.

Once in the ring your man should keep his eyes on *his* animal only, and never give him a chance of showing himself off badly. A A light touch of a small whip, the smell of a hand with a little Thorley's food on it, a word, a low whistle, may do wonders where there is a proper understanding, as there should be, between the man and his beast. A properly fitting white web halter smartens up an animal, especially if the cord is pipe-clayed.

SUMMER SHOWS.

A few words on the preparation for the summer shows.

The absurd size to which breeding stock are fattened leads one to ask the question "Are summer shows intended to benefit the tenant farmer or not?"

No one can deny to himself that it is a pleasure to see animals turned out in the pink of perfection ; but of what use are these monsters to a man except as an advertisement ? Is the game worth the candle ? But few are fit for breeding purposes until they have been thinned down again. All this means loss of time, and instead of animals which are the pick of the herds they represent being made the most of, they leave but few of their descendants behind them.

Many of the bulls, especially in the older classes, are too heavy for use, but until the various societies make up their minds to condemn the practice no alteration can be expected. Again, is it fair to ask a tenant farmer to compete against a man who shows for the mere sake of showing, and spares no expense in fatting an animal up. As it is many a useful animal has to give place to others in its class which are only fit for the butcher. Good milkers, too, have to give way to the beef type of animal. If some of our prominent judges refused to award prizes to these mountains of fat, and selected the animals fit to breed from instead, they would be doing a real service to every tenant farmer in England.

EXPERIMENTS ON PASTURE, 1903.

FIELD NO. 13.

Experiments were continued on the 20 plots, each $\frac{1}{20}$ acre, used the last eleven years or more (see *Agricultural Students' Gazette*, April, 1889, August 1889 and 1890, December, 1891, August, 1892, 1893, and 1894, July, 1895, and August, 1896, 1897, 1898, 1899, 1900, 1901, and 1902, and December, 1902), the manures applied to each lot being the same in kind and in amount as in the previous years.

The manures and their amounts per acre were as follows :—

NO. OF PLOT.		AMOUNT PER ACRE.	
A3.	Rape meal	5	cwt.
A2.	Thomas' basic slag	10	,,
A1.	Farm-yard manure	12	tons
1.	Sodium nitrate	2½	cwt.
2.	Kainite	5	,,
3.	Equalised Peruvian guano	5	,,
4.	Superphosphate	5	,,
	Ammonium sulphate	2	,,
5.	Kainite	5	,,
	Superphosphate	5	,,
6.	Kainite	5	,,
	Superphosphate	5	,,
	Sodium nitrate	2½	,,
7.	Unmanured		
8.	Kainite	5	,,
	Superphosphate	5	,,
	Ammonium sulphate	2	,,

NO. OF PLOT.		AMOUNT PER ACRE.	
9.	Ammonium sulphate	2	,,
10.	Kainite	5	,,
	Sodium nitrate	2½	,,
11.	Kainite	5	,,
	Ammonium sulphate	2	,,
12.	Equalised Peruvian guano	5	,,
13.	Superphosphate	5	,,
14.	Superphosphate	5	,,
	Sodium nitrate	2½	,,
B1.	Farm-yard manure	12	tons.
B2.	Thomas' basic slag	10	cwt.
B3.	Rape meal	5	,,

This is the sixteenth year in succession for the application of the same manure to plots 1—14, the fifteenth year of the farm-yard manure plots, and the twelfth year of the application of Thomas' basic slag and rape meal.

The farm-yard manure and the kainite, basic slag, and rape meal were applied on January 10 ; the superphosphate and guano on February 28 ; the ammonium sulphate on March 17 ; and the sodium nitrate on April 11, 1903.

The guano, equalised Peruvian, contained combined nitrogen equivalent to ammonia, 7·5 per cent., phosphates 31·1 per cent., and potash 2·1 per cent.

The superphosphate contained 26·5 per cent. of "soluble" phosphate, and 2·3 per cent. of insoluble phosphate.

The kainite contained 12·6 per cent. of potash (K_2O).

The sodium nitrate contained 95·0 per cent. of pure nitrate, equivalent to 19·0 per cent. of ammonia, and the ammonium sulphate contained 24·6 per cent. of ammonia.

The basic slag contained phosphates equivalent to 39 per cent. of tricalcic phosphate.

The grass was cut on June 17th and weighed on June 26th ; rain fell on the 17th, 19th, 24th, and 25th, but the hay was very well got.

The yield of the plots, calculated to amounts per acre, was as follows :

		Per acre. cwts.	Excess over Unmanured plot. cwts.
A3.	Rape meal	23¼	5
A2.	Thomas' basic slag	24⅛	5⅞
A1.	Farm-yard manure	38⅝	20⅜
1.	Sodium nitrate	20⅞	2⅝
2.	Kainite	14	—
3.	Guano	31¼	13
4.	Superphosphate and ammonium sulphate	32⅝	14⅜
5.	Kainite and superphosphate	25¾	7½

		Per acre. cwts.	Excess over Unmanured plot. cwts.
6.	Kainite, superphosphate, and sodium nitrate	$42\frac{7}{8}$	$26\frac{5}{8}$
7.	Unmanured	$18\frac{1}{4}$	—
8.	Kainite, superphosphate, and ammonium sulphate	$36\frac{1}{2}$	$18\frac{1}{4}$
9.	Ammonium sulphate	$20\frac{3}{4}$	$2\frac{1}{2}$
10.	Kainite and sodium nitrate	$32\frac{7}{8}$	$14\frac{5}{8}$
11.	Kainite and ammonium sulphate ...	$34\frac{1}{8}$	$15\frac{7}{8}$
12.	Guano	35	$16\frac{3}{4}$
13.	Superphosphate	27	$8\frac{3}{4}$
14.	Superphosphate and sodium nitrate ...	$41\frac{1}{4}$	23
B1.	Farm-yard manure	47	$28\frac{3}{4}$
B2.	Thomas' basic slag	$32\frac{3}{4}$	$14\frac{1}{2}$
B3.	Rape meal	$28\frac{7}{8}$	$10\frac{5}{8}$

Some of the meteorological observations during the first half of the year are given below :—

	Rain Inches.	Rainy days	Average Rainfall, 34 years.	Mean temp. F°.	Days of frost on grass.
January ...	3·23	20	2·55	38°2	19
February ...	1·42	12	2·18	45°0	10
March ...	3·77	23	1·93	44°8	12
April ...	2·52	13	1·89	42°7	15
May ...	4·48	19	2·08	51°0	5
June to 16th	3·88	8		58°9	0
	19·30	95	12·70		

The rainfall after cutting the grass until the hay was carried was June 17th, ·05 ; June 19th, ·78 ; June 24th, ·01 ; June 25th, ·01.

The plot which receives kainite alone showed less growth than the unmanured plot. Nitrate of soda alone, and sulphate of ammonia alone, gave but a small increase ; but when applied in conjunction with kainite a very respectable increase was obtained of 14 or 15 cwts. of hay. Nitrate of soda or sulphate of ammonia with phosphates gave a large increase of hay, in the first case more than double the unmanured plot, but of rather a coarse quality. With mixed cinereals and ammonium sulphate the yield was double that of the unmanured, whilst nitrate of soda and mixed cinereals gave an increase of 20 cwts., being beaten only by one of the farm-yard manure plots.

Guano gave an excellent increase of 14 cwt. of hay, and the quality of the hay on these plots was the best.

The highest yield was given by one of the farm-yard manure plots. The next in order of yield are the plots receiving mixed cinereals (superphosphate and kainite) with nitrate of soda, superphosphate and nitrate of soda, and mixed cinereals with ammonium sulphate. These gave from 36 cwts. to 47 cwts. of hay per acre, being from twice to two and a half times the yield of the unmanured plot.

Nitrate of soda gave generally rather higher results than sulphate of ammonia under like conditions.

The average yield per acre of all the plots was $30\frac{3}{8}$ cwts. This is less than the yield of last year but double the yield of 1901 : it is just above the average yield of the last 15 years. The influence of the better soil at the East end of the field—B plots—over that at the West end—A plots—is more marked this season than has generally been the case.

The amount of smut in the field was less than usual.

After hay harvest the whole field was grazed with cows and sheep.

E. K.

NOTES ON CAPE FARMING.

To anyone concerned in farming pursuits in Great Britain, the value of a knowledge of insects, their identification and life history, is fortunately well understood, and in these notes I wish to suggest that it is equally, if not more important, for the Colonial farmer to have some knowledge of the subject.

In all parts of Cape Colony, and in every branch of farming, ticks and insect pests cause trouble, and there is no reason to believe that this country is especially ill-favoured in this respect. In the Western Province the vine farmers have *Phylloxera*, and injury is caused by weevils of the genus *Calandra*. In the Eastern Province the farmers' flocks are decimated by the ravages of heartwater, his herds almost equally affected by red-water, both diseases introduced by ticks. Locusts give trouble everywhere at irregular intervals ; while the larvæ of various fruit flies and moths also cause great injury in all parts of the Colony.

Perhaps a brief notice of the bout or variegated tick, *Amblyomma hebraeum*, will illustrate to some extent the amount of damage that is caused by one of these pests. Within the last generation many thousands of acres of some of the best sheep carrying veld in the Colony have been abandoned to the less remunerative pursuit of cattle farming, solely on account of the spread of this disease-bearing tick. The life history of the tick occupies three stages. The eggs are laid by the full grown female in a sheltered spot among the herbage where the parasite has dropped from its host. It is more difficult to incubate successfully artificially than that of any other species studied, and the period of incubation is decidedly longer. A certain amount of moisture and the absence of direct sunlight appears to be requisite.

The relative immunity of animals on open grass veld from the bout tick is probably largely due to the relative lack of cover for the eggs there deposited, and there is also less cover and protection for the adult females. In good seasons, when the grass is long and rain comes at fairly regular intervals, better cover and greater moisture allow large numbers to propagate their species.

When the eggs hatch, the young larvæ crawl up to the top of the grass stems or to the outer branches of bushes, and await an opportunity of attaching themselves to any moving body that may come in contact with them. As they can remain alive for at least six months in this stage without food or moisture, it must be seldom that there is no opportunity for attaching themselves to a host, provided they escape the attack of their natural enemies in the meantime. In this stage the tick attaches itself almost anywhere on the body of the host, and within a period varying from five to eight days it is fully fed with the blood of the host. It then becomes detached and drops to the ground. After a time it sheds its skin, entering the second or nymphal stage, when it again seeks a host, becomes gorged in about eight days, and again drops off to rest and shed its skin. In the third or adult stage the tick seeks the udder, belly, and genitals of the animal, and the male attaches itself to the female when the latter becomes full grown, which takes from seven to twelve days. The adult males stay longer on the host and may conjoin with more than one female in the time.

The time occupied in the change from one stage to another varies greatly with the temperature and other causes. A temperature of between 85°F and 95°F is most favourable, and actual moulting begins in from fifteen to eighteen days; moisture does not appear to be essential. The vitality of the tick in its various active stages is remarkable; it may survive without food or moisture for at least seven, four, and five months respectively in its three stages without finding a host, and probably in individual cases much longer.

The tick in itself would have comparatively little detrimental effect on the animal affected were it not the host of a minute organism which causes a disease of the sheep known as heartwater. This organism seems to require the use of both the tick and the sheep (an invertebrate and a vertebrate) for its development, and in the course of its career in the sheep gives it heartwater. This disease is peculiarly fatal to sheep and goats, and in all probability can be communicated to them only through the agency of the bont tick, though possibly by other means. The organisms causing the disease can be transmitted from the larva to the nymph, and from this stage to the adult, and probably through the adult female to the egg.

No certain cure has as yet been discovered for heartwater, though various systems of treatment have been tried, some of which confer more or less immunity from the disease. Some farmers put their faith in a certain secret method of inoculation, the discoverer of which claims for it that it is a valuable and economical preventative remedy for the disease, but it has been tested by the Government Veterinary Surgeons and discredited. Others, again, firmly believe that the constant practice of dipping their sheep in a well-known arsenical dip is a great check to the disease. Various other remedies are tried, and among those that have come to my notice besides the arsenical dip (the sovereign remedy for all diseases of stock with many Cape farmers), are alum and sulphate of iron. The only satisfactory treatment at present known is to destroy the tick, or to destroy the disease germ in the tick, both tasks extremely difficult to perform. The usual methods adapted in keeping down the ticks, on those farms where this duty is attempted, are to spray all the cattle and horses at regular intervals with an emulsion of paraffin with soap and water, and, whenever possible, to burn off such portions of the farm as can be spared.

These methods have been proved insufficient to exterminate the tick, and great faith is put by those who best understand the question in eradicating the tick, and with it heartwater, by starving it out. This would necessitate excluding all stock from the affected veld for the necessary period of time. According to a useful and time-honoured custom, the Government has been recently requested to make exhaustive experiments to demonstrate whether this can be done at a reasonable cost of time and money. Whatever the result of these experiments may be, I think that it is improbable that the Colony, in its present political and social condition, will be able to exterminate the bout tick for many years to come. The same causes that combine to render the suppression of scab impossible will also operate in this matter.

The Government Entomologist of the Cape Colony has done the greater part of the work in connection with the investigation of the life history of the bout tick and its connection with heartwater, and his official reports contain a full account of the whole experiments.

With regard to the suppression of two other insect pests various methods are employed. Locusts are destroyed by means of a fungus which acts well under favourable conditions, but as a certain amount of moisture is necessary to make it an efficient enemy to the locust, it is not always such a success as could be wished. Many lots of "voetgangers," or wingless locusts, are destroyed by driving them within as small a space as possible towards evening, and in the early morning on the following day tramping them to death by means of a flock of sheep or goats. A popular method among some farmers is to drive them through the wire to their neighbour's veld, but this is not always to be recommended. They may also be destroyed by spraying with some insecticide, or driving them into pits.

For the destruction of other insects on fruit trees, etc., insecticides are used, while ladybirds of several species have been introduced from other countries to keep in check the various scales and aphides, in one or two cases with some success.

M. G. Godlonton, M.R.A.C.

FARMERS AND CO-OPERATION.

So much has of late been written on the subject of co-operation amongst farmers that one naturally hesitates to add more to the mass; but a good tale will bear the re-telling, and a strong conviction of the vital importance of the subject—a conviction born of experience—leads the writer to take the present opportunity of once again bringing the matter before the notice of those students of Agriculture into whose hands the future destinies of that great industry will be placed. Whether the students who read these pages become farmers, land agents, or landowners, it will be their duty, if the success of Agriculture is their desire, to give the fullest possible consideration to the subject of co-operation.

Let us first clearly understand what is meant by Agricultural co-operation. It is briefly the working together of farmers and others directly interested in the land for their common good. One of the reasons why agricultural co-operation has progressed so slowly in England is to be found in the sturdy independence and self-reliance of the British farmer, qualities which cannot do otherwise than command our admiration ; but it should be understood at the outset that by taking his part in a co-operative movement a farmer need not to any appreciable extent sacrifice those most excellent qualities.

The farmers of this country must have become somewhat weary of the constant exhortations made to them by advocates of co-operation to follow in the footsteps of the Danes and other foreign nations, whose methods have in so much detail been over and over again described to them ; but of late Ireland has supplanted Denmark as the object lesson used for the enlightenment of the British farmer, and there can be no doubt the example of the sister isle has been the means of more closely securing the attention of the British farmer than has ever before been the case. A visit to Ireland to see with one's own eyes what co-operation has done for the Irish farmer should convince the most sceptical of the solid advantages to be derived from this working together for the common good. It is not proposed in this short article to describe what is being done in Ireland, but those who desire to extend their acquaintance with that work will be well repaid by writing for explanatory leaflets to the Secretary of the Irish Agricultural Organisation Society, Dublin.

The real point of interest on the present occasion is how far can the British farmer, under his special circumstances, follow with success the example set by the Danes and the Irishman. The conditions in each case are undoubtedly widely different, and it may be at once said that to carry on in England the work of co-operative butter-making, as is done in Denmark and Ireland, would probably not lead to satisfactory results. But butter-making is only one of several departments of farming to which the principle of co-operation may apply.

It is generally admitted that the production and sale of new milk to milk dealers in the large towns is the most profitable form of dairy farming at the present time for the majority of dairy farmers, and it will be well, therefore, to see how far the co-operative principle can be applied to that business. The consumer of milk in London pays on the average twice as much for the milk he drinks as the farmer receives for it from the milk dealer. This fact alone makes one enquire whether the farmer is obtaining his fair share of the profits of the transaction, and, if not, how he can best secure the extra profit which is his due. It may at once be stated that by a complete system of co-operation the profits arising from the production and supply to consumers of raw milk should go entirely into the pockets of the farmers; but it will take some time to arrive at this stage of perfection, and we must lead up to it by easy stages. In the large towns there are the large wholesale milk firms, then there are smaller men, the retailers, and then come the consumers. The large wholesale firms buy from the farmers and sell to the retailers, making their profit on the transaction. The retailers sell to the consumers, making also their profit. We have here two profits to be taken out of the milk after it leaves the farmer and before it reaches the consumers. The first step is to transfer a portion of one of these profits into the pockets of the farmers, and this may be effectively done by the farmers joining together—co-operating—to appoint an agent of their own in the large towns, who shall as far as possible replace the wholesale dealer. The function of the agent is to put the farmers and the retailers into direct communication, so that they may trade directly with each other, and so dispense with one middleman in the transaction and secure a portion of his profit. This system has been carried on with much success by the Staffordshire and Derbyshire farmers and also in some other counties, and can therefore be recommended as a perfectly sound, practical means of improving the returns of the dairy farmer. To make the advantage quite clear it should be stated that the salary and expenses of an agent amount to but an insignificant sum compared to the increased income obtained by the better prices obtained for the milk. To those who have not gone carefully into the financial results of milk selling it is surprising to find to what a large figure the saving of even one of the middlemen's profit amounts in a year. To put it into a practical form, take a dairy herd of 50 cows, each producing an average of, say 600 gallons of milk a-year. If an increase of one penny per gallon can be obtained by a better system of marketing it amounts in this case to an extra profit of £125 in the year. The natural outcome of the agency system will be a further extension of the co-operation principle in the establishment of depôts in the towns owned and worked by the farmers, and thus the whole of the profits from cow to consumer will come into the pockets of the producers, who are surely those who ought to be well paid.

Another branch of Dairy Farming to which co-operative methods may be applied is that of cheese-making. Co-operative cheese factories exist in many parts of England, and although several have not been successful there are many which make a satisfactory return to the farmers working them. Cheese-making is as a rule not so profitable as milk selling, but in the summer months there is usually an over-production of milk, the town markets becoming flooded, and it is well that this excess of supply over demand should be kept in the country and converted into cheese, or cream, or sterilised milk. A factory at which cheese and other products are made when milk is plentiful, and from which milk is supplied at high prices in times when there is a short supply in the towns, will, with good management, yield most satisfactory returns to the farmers who own such a factory, and will at the same time be a means of minimising the fluctuations to which the milk market is so subject. In a co-operative factory the farmers take shares in proportion to the number of cows they milk, and after interest on capital is paid the profits are divided in proportion to the amount of milk supplied by each member. In connection with the factory the profitable marketing of eggs and poultry may be undertaken.

Leaving now the dairy department, let us enquire how co-operation may be applied to other matters. There is no doubt that feeding stuffs and artificial fertilisers may be obtained more cheaply and of a better quality through a farmers' co-operative society than by the farmers individually. If the farmers within an area served by one railway station combine and put all their requirements in the way of feeding stuffs and fertilisers together, the result will be that better terms will be made with the manufacturers, and better terms for railway carriage will be obtained, in both cases because of the larger consignments. There is the further advantage that only one sample of each combined consignment need be taken for analysis, the cost of which distributed amongst the combined purchasers would not be felt, whereas in the case of purchasing individually the cost of analysis is often prohibitive, and consequently the goods are received without question as being up to the guarantee on the invoice. This fact is well known to the unscrupulous dealer, and in many cases, it is feared, inferior goods are supplied. A Co-operative Agricultural Society of the kind here suggested would also purchase implements, dairy appliances, seeds, and in fact most farm requisites. It will also be found that coal is an article that may be purchased to advantage through such a society.

There are many other objects for which farmers may with much advantage combine together, depending on the special circumstances of the different localities, but the examples already given will serve the purpose of the present article. Farmers' Associations to be of the greatest benefit to their members should have some definite practical objects to carry out, something more than the holding of meetings, reading of papers, and passing of resolutions to be sent to this, that, or the other Authority. Let it be shown that something will be done that leads to the immediate improvement of the "balance at the bank," and it will be found that farmers are not so slow to co-operate as they are generally supposed to be. Let each county become organised, and then let all the counties link themselves together and there will arise a system of Agricultural Co-operation which must result in a distinct all-round gain to British Agriculture.

EDWIN SMITHELLS.

SOME AGRICULTURAL METHODS.

A MONTENEGRIN SKETCH.

"Gospodin! Gospodin! God greet you, but why in the name of His Mercy have you wound that white rag round your cap? The heat? There be things deadlier than the rays of the sun. What? A bullet between the eyes, if you would know, and that has waited no more than the touch of my trigger finger since you topped the ridge. A *white* fez! Is it strange that I took you for an Albanian? As you wandered through the boulders my rifle sights were strained to your brow as the line strains to the hooked fish. I but waited for your first halt—and then— My heart thunders in my breast at the nearness of it!

"Whom did I expect? Who, but that swine-begotten Osman of Tusi, my creditor for a ruined crop, a score of insults, and—in every deliberate intention—for my death. And I, who sixty seconds ago believed that I was going to write my bullet's full receipt across his bill, find—you, Gospodin, masquerading in white of all colours. Thank all God's Saints that it has not been dyed a quick crimson with your blood!

"Why? There are a dozen reasons, but one suffices. He is an Albanian, and the rifles have been dinning that argument out through centuries of border fray. He is Albanian, I say, and of a breed of dogs. To those sufficient grounds for his despatch he has added others, every one of them meriting an attention that only my rifle can give. Take a cigarette while I explain. Yes—the tobacco is well cured, and grown within ten yards of where we sit.

"You see my little patch? Do you know the labour that has gone to the making of it—the boulders tugged from the clinging soil—the new earth won from a dozen crevices—the sweat that has been poured upon it like water into a sponge? Nay—what can you know of this? But there you see it, clean, weed-banned, a model for the frontier from Kolasin to Zatrijebac—a plot worthy of the envy that it gets.

"Yes—I own it—it has become part of me, this little patch of sun-sucking soil—it is wife to me, son to me, part of my being. The planting, the watering, the plying of the hoe through the heats of May and June—these are my caresses to my love. And amply am I repaid. No such leaf is grown between here and Niksic as that which you hold betwixt your fingers. Drink it down—inhale it! Sweet as mountain honey, is it not? And light—light as a feather. No saltpetre there to draw in the damp and sour it with its weight.

"And so, mark you, he that would wound me but cannot reach my toughened hide strikes me through my land. And Osman, slinking jackal that he is, has so struck, not once, nor twice, but a score of times. Praise God you are safe, Gospodin, but yet—well, well, of a truth two minutes back I thrilled with ecstasy, believing that his evil race was run.

"The quarrel? A mere difference of the market place—a trifle of weight and price that none save a shred-snatching Albanian would have concerned himself with. In Podgorica, in some Monday's trafficking, he bought of me tobacco—such luscious leaf, look you, as that you smoke. After the bargain he used other scales to it, and swore that I had cheated him of three kreutzers weight.

"Could I do more or less than meet his claim in lead—from my revolver? We drew together. Both fell, he with a useless arm, I with a bleeding hip. We healed in prison, where they celled us both for strife within the precincts of the town.

"They gave him liberty a week before they restored me mine. He went back to his clan, muttering threats into that black beard of his, and threats—to that pig-bred tribe of the Kuc—are fuel to fire. Seven days later I, too, came toiling up the crags, using my first hour of freedom to visit my little acre that had been left through the month's prisoning untilled.

"What was my welcome? One to gall the blood of Heaven's own Angels, and I—am no angel. I topped the ridge in the moonlight, yearning for the first sight of the tender green leaf upon the sun-baked soil. What did I see? No young leaf, and, indeed, but little soil! For the patch was glutted with men—swarmed with white-fezzed Albanian dogs, dancing—ay, dancing!—over every inch of the earth that had sucked the sweat of my brow! Silently, malignantly, agrin with their evil mirth they were hammering tilth and leaf into a paste —a floor as hard as the rocks that ringed it!

"Hesitate? Gospodin—if a magazine has been emptied more swiftly than was mine into that mob of buffoons it must have been from some miracle worker's fingers. I had sent five bullets among them and snapped the breach block upon five more ere the first discharge had finished echoing up the valley to Ostrog!

"Three staggered: none dropped. The rest came leaping up the cliff like cats. And bitterly they regret it to this day. Only one reached the border unscathed, and he—as that vile jade Chance would have it—was Osman himself. For I was behind this boulder, the cliff was at my back, and to win in out of the open they would have had to meet my revolver muzzle in the narrows between stone and stone. Within ten minutes, too, the border was up. Half a hundred of my own clan came seeking explanations, rifle in hand. To make a long tale short, the Kuci reached their lairs along a trail of blood hand-broad on every crag they passed. Two stayed—our invitation was pressing. Yes—those little cairns mark the spot. No less than twelve bullets apiece were in their evil carcases.

"And now, of course, the feud is open between me and Osman, between mine own men and those of the Kuc. He has had his revenges, while I—. But I wait my time. You know the spring that drips through the summer past Miho's cabin on the slope? Ay, but do you know that in the winter it is a torrent waist deep? Osman knew as much, considered it, and used the knowledge for his villainies.

"In February I made my first visit here to see if the soil peeped through the drifts. I found no soil, but a pool fast bound in six solid feet of ice. The knave had shifted the channel, driven it athwart the shoulder of the hill, and drowned my land at the bottom of a new made lake! A week later, at the hand of a stranger he sent me a broken basket to mend, learning, as he said, that I was raising a marketable crop of reeds. A jest! Ay, one for which he shall receive a weightier answer than words.

"Thus his first effort. Listen to his second. I had hewed aside the ice blocks, lit a fire of beech, and melted the bound soil to softness again. Then night by night I waited among the crevices to deal him welcome when his evil heart moved him to further misdoing. Yet for two long months he made no sign, and I grew careless. 'Mitri married Mirko Giritich's daughter and I attended their little festa.

"Afterwards I came up here, strolling through the moonlight, and even then with misgiving in my heart, to hear the clatter of stone meeting stone, and to see a dozen mighty boulders go leaping down the crag and thunder into my plot. The snake! I caught a glimpse of a white patch upon the upper ledges and sent a bullet in chase. Upon the rock where it disappeared there remained a scarlet stain. But what did it mean? No more than a flesh wound—a graze, so I learned from friends beyond the border, while his whole village was asmile at his triumph. My young plants were pulp and a third of my crop gone, while the price was but the half of a cupful of Osman's blood!

"And so has it been from month to month. Let me relax my vigilance for an hour and I lament it. He lurks unresting on the mountain side to work me injury—he neglects his own affairs to do me despite. Stones hail upon my crops—cattle are stampeded through my fence—every stray goat of the hills is herded upon my plot. And now, Gospodin, now I thought the end had come. I had spread the report that I had gone into Podgorica for cartridges—I had paced a full mile down the road before I slipped aside to gain this lair, and when your white fez gleamed—but it will not bear thinking of. Take another cigarette.

"Crouch! Gospodin, crouch! Behind this stone—so! That is well! No, nothing shows, but look you—look! Those sheep have been startled; something moves behind the ridge. Ay, there—there! You don't see? To the right of the stunted pine—something white glimpsing among the shrubs. By the Saints, now that you have heard the story's beginning I will write its ending plain for you in blood. Nay; my hand shakes not a hairsbreadth. I have him covered as straightly as a target—when he passes that broken pinnacle ...... I have marked the range do you see ...... one hundred yards ......

"Ay, I have tricked him. Note how carelessly he walks—thinking me five miles down the valley by now. Already I have him as good as dead, but I wait for certainty—certainty ...... another fifty paces ...... when he shows stark against the cliff wall ......

"Gospodin! Gospodin! take it—take my rifle before I let it drop! Do you not see? God's Mother, do you not see? Shaken? Every nerve—every thew in my body trembles—my heart bursts. *Now* do you understand, for—for—is it not plain? An Albanian? Nay; not even a man, but Zorka, my Zorka, mine own wife …… and in ten seconds …… nay, in five …… I pant, Gospodin .. … I pant ……

"Woman! in the name of all the Saints what has brought you here? News? What care I for news? Have I nothing to occupy me save the chatter of the market place? Am I an innkeeper that I should gape and gossip?

"Osman—God curse him! *What!* Bloodguilty in his own clan; seeking sanctuary across the border! Gospodin, I ask you, is there justice on earth—and where, then, am I to find it? Six months waiting, a whole half year of toil, and heartsickness, and insult …… and *now* ……

"Woman! get back to your home and your tending! Your news has smirched the very sunshine with shadow …… and indeed, Gospodin, I would be alone …… To have the purpose of a year torn from one in an instant …… To have the very aim of life set awry …… God greet you, God be with you …… but in mercy …… go! …… go!"

FRANK SAVILE.

[NOTE.—In Montenegrin-Albanian vendetta, should one of the parties to the feud become outlaw in his *own* land and seek refuge across the border, hospitality and etiquette decree that the quarrel must lapse—for the time being.)

SOME WILD FOWL SEEN IN SHROPSHIRE.

It may interest some of our naturalist readers to hear something about the Wild Fowl on the pool at Peplow, in Shropshire, through which the river Tern runs on its way to join the Severn at Atcham Bridge. In the autumn of 1900, a weird story of the Peplow Geese, both Canadians (*Anser Canadensis*) and Egyptians (*A. Ægyptiacus*) found its way into many papers in England, and one enthusiastic gentleman is said to have given a lecture on them at Stone, in Staffordshire. The accounts were many and various, but the chief point was that on the afternoon that their late owner died, the geese, about one hundred and fifty in number, did fly round and round the house shrieking their peculiar and weird call as if they knew that their late master was dead. Many people have assured me that birds do know these sad events, and do these strange things, but I leave this to the reader to believe or not as he likes. This happened on October 7th, and this date more or less coincides with the dates on which these birds, both before and since, have done this. At this time of year the birds usually stay on or near the pool, and as evening draws on they fly off to the neighbouring clover or stubble fields to feed; then as the year goes on they go further and further afield hunting for fresh ground, and I am sorry to say they often pay the penalty of death for poaching on other people's land, and thus a Michaelmas goose weighing about 12lbs. comes to the table, but not from the farm yard.

Both the Canadian and Egyptian geese at Peplow were originally brought there, and have been preserved for many years, but there are also many Canadians on the neighbouring large pools, and often all these geese pack together in winter, and then go the round of the different pools. Often have I seen two hundred or more thus wandering, but those that belong to us always return in the spring. I have read that in Canada this goose is much esteemed for food, but all those I have eaten in England, either old or young, have been far from nice. If the young are pinioned and shut up and fed on corn they are passable, though not to be compared with our grey-leg goose. The Canadian generally lays from six to eight eggs in a rough nest on one of the islands, as do the Egyptians, but one never sees them have anything to do with each other during the mating or breeding season, and they always take possession of different islands. In both cases the male keeps guard near the nest as in the swan tribe, the moulting taking place when they are bringing up their young. The Egyptians are much more domesticated than the Canadians and seldom leave the pool or river except to feed, when they generally go on to some meadow but never far from the water, and they return when danger is seen; they are certainly better to eat than the Canadians, and never seem to fly for pleasure. The old birds take the greatest care of their youngsters, and when they take them into the water out of harm's way they make the young swim so that the old ones surround them; thus they swim away out into the pool in the formation of an escort in charge of a convoy.

The swans which frequent the river are the Hoopers, which are too well known to need description. We also have the Black Swan with red on his head, a most handsome bird; but swans are never welcomed at Peplow as they drive the other water fowl away.

Of the fancy ducks we have the Muscovy and the pretty White Call Ducks, whilst of the real wild ducks we have the surface feeding Mallards, Wigeon, and Teal, and of the diving ones the Tufted Duck, the red-headed Pochard, the Golden Eye, the Scaup, and our little grebe, the Dabchick. The mallard has often been written about but nowhere better than in J. G. Millais' book, "The Surface Feeding Ducks," his pictures and accounts of their double moult being wonderfully described. Anyone with a fancy for ducks will find much to interest him in watching them through a telescope in the evenings, especially when the males are courting the females and *vice versa*: the antics they go through to display themselves are wonderful and various, but this courtship is not lasting, as, after the duck has hatched off her young, Mr. Mallard goes off in bachelor parties of five, six, or seven, leaving the duck to bring up the family. One excuse for the drake is that he does not wish the young ones to see him when he is moulting, when he looks a poor fellow and often has lost so many feathers that he cannot fly and can be caught by a dog. Ducks go through many tricks to stir up the mud so that they can get the water insects of which they are so fond. Paddling with the body erect is the favourite way to do this. Many of our young ducks are killed by the pike, who eat up whole families; it is sad to see them being dragged under one after another, and it is done so quietly that the old one hardly notices what is going on, but when many are gone she gets into a dreadful fuss hunting for her lost children.

The wigeon comes to us in October and stays through February, but, so far, I have never found a nest, though in some places they do breed in England and often in Scotland. They are a good-eating duck, and are generally plentiful, as they come in large flocks or companies, as they are called, and they seem to move frequently to fresh water. As they feed in the day time they easily fall a prey to the gunner, especially as they feed a good deal on short grass like the geese, but so very unlike the mallard, teal, and pochard, who sit sporting or reposing during the day waiting till evening to feed. The wigeon is intermediate in size between the mallard and teal, and gives more sport than any of our winter visitors. It is a duck much sought after by the punt and shore gunner, but the latter must remember that, as with all ducks, he must never shoot till the bird is over, sideways, or going away, as, if he shoot when the bird is coming directly at him, the shot strikes the bird on most tightly set and compressed feathers and down, and the pellets only glance off, to the disappointment of the sportsman.

The teal is the smallest of our ducks, but one of the best to eat, and, with us, the first to come and the last to leave in the spring. They seem to prefer the inland lakes to the sea shores, but they never seem to stay long anywhere, yet, as they are plentiful, fresh ones are always coming. A great peculiarity of the teal is the way it rises out of the water, springing up vertically into the air much unlike most ducks, who rise always against the wind.

The tufted duck is much sought after, and during the winter of 1901 they came in considerable numbers, but none stayed to breed, though five miles away, at Ellerton, many of this species have acclimatised themselves, and can be seen any time of the year, which does not agree with the views of many of our writers on ducks. I have never seen these ducks come by themselves, but always in company with the pochard and golden eye; in a mild winter, such as our last, only one pair came to this pool.

The red-headed pochard is another of our winter visitors, and always can be recognised by its red head and neck. They are common enough in our poultry shops, as they are plentiful and excellent to eat. They feed by night, and many are shot by stalking them by moonlight. You can often tell their whereabouts by the low whistling noise they make. These ducks have been acclimatised in many of our pools in England, and do remarkably well, besides being very picturesque.

The golden eye is one of the prettiest of our migratory birds who visit us in winter, but it is not considered a good bird for the table. On our inland lakes the female and her young are the usual specimens seen. Compared with the pochard it is a most active duck, and swims and dives with great rapidity after the young fish on which it feeds. These ducks always seem on the alert, and always have one of their number on sentry duty. These birds are more often found on the river than on the pools, as they prefer the shallow waters in which it is easier to catch young fish. The moulting period is later than with any other of our ducks, which accounts for some of its late habits.

The scaup duck only visits our inland lakes in very hard winters, and, being a fish eater, is not considered a good dish. It is very shy and hard to get near, and not many are found in the bag after a day among the ducks. This bird makes a very short stay with us, only coming the end of December, and usually going off again the end of January, but one never seems to find this bird poor in condition. Its appearance is very like the red-headed pochard, and it is often mistaken for it, but for the table it is nothing like as good to eat; but here many more pochards are killed than even scaups are seen.

The little grebe or dabchick is common, remaining all the year in both pools and rivers, but it is seldom seen to fly or walk, its whole body being made for swimming and diving, at both of which it is an adept. Its food is small fish and aquatic insects, and so it is not an edible bird. Nothing is prettier to watch than a young family swimming and diving for their food, and the time they stay under the water when only a few days old is very extraordinary. Apart from coots and waterhens the above form the chief of the water fowl seen on our far inland lakes.

BEVILLE STANIER, M.R.A.C., F.Z.S.

FARMING IN NORMANDY.

Having had an opportunity of seeing the agriculture of this part of France under especially favourable conditions, I have no doubt many readers of the *Students' Gazette* will be interested in reading a short account of the impressions I received, and the special features of farming as carried on by our neighbours across the channel. Arthur Young, in his tour through the French provinces more than a century ago, commented upon the large proportion of superior soil, and considered the average to be better than that of England. He was, however, obliged to admit "it was very badly cultivated." During the past century a great change must have taken place, for instead of the "dead and useless fallows covered with weeds" spoken of by Young you see even the poorer lands well cultivated right up to the edge of the roads. The area of Normandy is about one-third greater than Wales, and its population under two millions, of which four-fifths are classed as rural. Rouen and Caen are the two principal inland towns, and there are but few others which number more than six thousand inhabitants. One half of the population may be described as agricultural, and the other half manufacturing. Of the former, a large per centage own the land they cultivate. A great many of the holdings are small, and but few of the farmers reside upon them. They seem to prefer dwelling together in small villages, although there must be much loss of time and labour in going to and from their work. Much of the land in the

Valley of the Seine, from Paris to Rouen, and on to Honfleur, is upon a chalk formation, and varies considerably in quality. The industry of the peasant-owners is very marked, and their thrift almost carried to excess. They slave to make the land yield as much as possible, their wives assisting in the hard labour, all with the object of adding to their savings. In passing up this fine river one is surprised at the small number of vessels to be seen. Although the principal water-way of Normandy, it looks almost deserted. The rich grass lands of this province are made famous by the large amount of dairy produce sent to different countries. The exportation of butter from France to England in 1902 was more than 400,000 cwts, a greater quantity than from any other country except Denmark. By far the larger bulk of the herbage consists of *Lolium perenne, Dactylis glomerata, Trifolium repens*, and *Trifolium pratense perenne.* The pastures of Isigny rest upon a very fertile marine alluvium, and are probably some of the most productive in the country. Those in the valley of the Auge are almost exclusively devoted to fattening cattle and sheep, and, on examining these pastures, it is also found that about fifty per cent. consists of graminaceous plants, chiefly *Lolium perenne,* and the rest *Trifolium repens* and *pratense.* Not only is the grass of high quality, but the Normandy farmers may well be as proud of their Cotentin breed of dairy cows, which develops remarkably good milk-producing qualities, and, when no longer required for milk, furnish large carcases of beef. The Nivernais and Manceaux breeds of cattle are chiefly used for draft purposes, and at five or six years of age fattened off for beef. The former are principally white. Both classes are admirably adapted for grazing, being quiet and exceedingly well-bred. The excellent flavour and keeping qualities of the Normandy butter, which commands such a high price in the London markets, is no doubt due more to the superior nature of the herbage than to the method of manufacturing the butter. This product is not dealt with in the clean and careful way of our English dairy-maids. At one factory, where butter is collected from a great many small farmers, the different lots are blended, thoroughly worked, and then put into packages for export, as much as twenty-five thousand pounds weight passing through the dairy in one day. Not only is Normandy famous for its butter, but Camembert cheese is also made, and exported in large and increasing quantities. At the factory at Le Breuil-Blangy as many as 200,000 of these cheeses are in stock at one time. The process of making and ripening occupies about two months: Paris taste requiring them more developed than that of London. An idea of the large proportions of the dairy industry of Normandy can be gained from the fact that one company, collecting milk at fifty different centres, deals with a total amount of twenty million gallons per annum, about half of which is used for butter-making, the remainder being devoted to cheese, and to supplying fresh cream and milk to Paris. Great waggons are sent round from the factories to collect the milk from the farmers, who are paid at the rate of about fourpence per gallon. The dried and hardened casein of the skim milk is converted into imitation-ivory billiard balls, and the like. Gruyere, or Emmenthal cheese, is also made in this district. In all places where cultivation is carried on in a small way by the peasant proprietors, no hedges or fences are used to divide the different properties, and the land has the peculiar appearance of being separated into narrow pieces covered with different crops. Where this system prevails the farmers have to tether their cattle and horses on the grass or clover portions, giving them a fresh piece as required by moving the iron pin to which their tether is attached. It is no uncommon thing to see forty or fifty horses and cows fastened in this way to graze after the work of the day is over.

At Caen milk is supplied by the Corporation to the very poor at low rates. The result of this policy has been a wonderful reduction in infant mortality.

At some of the larger farms, where the making of high-class butter is practised, the milk is set in brown, earthern, glazed pots, at a depth of twelve to sixteen inches, and skimmed twice, at intervals of twenty-four hours. The cream is churned twice a week, and the skim milk, which becomes quite sour and thick (or "loppered," as it is termed in Scotland), is given to calves three times a day, in broad, flat-bottomed vessels, which they cannot knock over. That they thrive upon this diet can be testified by a visit to Caen market, where rows of these fat calves, of uniform size, are disposed of every week by the farmers of the district.

The agricultural horses are of the Percheron breed, and, although they will not compare with our Shires or Clydesdales for size, they are well adapted for the work required of them. The larger proportion are greys, and it is a common practice to leave the males entire, and to work all horses without winkers. Under the peasant ownership system so general in France, with the assistance of protective duties on corn, it is quite possible for them to cultivate poor land, which in this country would probably be used only for sheep-grazing and golf courses. Lucerne and sainfoin are largely grown, and cut green for the stock, which is kept in byres or stables. Colza, or rape, as we generally term it, is extensively grown for the purpose of extracting the oil, and the country is brightened during the spring months with its masses of yellow flowers. Though the province of Normandy has no special training institution for farmers, the French National School of Agriculture at Plaisir-Grignon, a few miles south of Paris, is not far distant. It is presided over by Mons. Erouard Riolle, who is assisted by a large and efficient staff of Professors. The students (all in residence) number about one hundred and fifty. The course of study extends over three years, and the fees are equal to about fifty pounds per annum. The buildings are fairly commodious but plain. They are soon to be remodelled by the Government, and new laboratories erected. The farm consists of 325 acres, and is well managed, a comparatively small portion being devoted to experimental work. Oxen of the Charolaise breed are regularly worked, and kept well shod with flat iron shoes.

The oxen, horses, milch cows and sheep, are all kept in sheds, and fed on the "soiling" system for a great portion of the year, green food being cut and carried to them daily. They only go out to graze after the corn is harvested. There are practically no fences within which they can be kept as in this country. The general order and appearance of the College and farm premises is satisfactory. It is optional for the students to take an active part in the practical work of the farm. Many of them elect to do so, and appear to enjoy it. As they do not enter into sports and games, as we do in England, some real work for their muscles must be rather refreshing than otherwise.

The students usually dress during College hours in a blue blouse costume, and in this respect are quite a contrast to the students of the R.A.C. The Grignon authorities are proud of their Botanic Garden, and claim that it contains an almost complete collection of plants adapted for the northern part of France. One can hardly congratulate them upon success in keeping down pernicious weeds in the garden. Wild garlic and *Allium vineale* is much in evidence, and seems to have taken possession, and determined to stay. The sheep of the College farm, chiefly of the Leicester, or, as they term them, "Dishley" breed, are clean and thriving, and, apparently, quite reconciled to living in sheds with straw as litter; grass, beet roots, and oats, with a lick of rock-salt, as their diet.

The limited space in the "*Gazette*" forbids my giving more particulars of the farming in Normandy, but I can assure those who may travel in that interesting province, that they will see much that is instructive, and find they can pick up many useful ideas in connection with the general management of land as well as of cattle.

EDWARD BLUNDELL.

THE ROYAL AGRICULTURAL COLLEGE CLUB.

ANNUAL DINNER.

A new departure was made on this occasion, and a change of time of the year and place of meeting resulted in a very successful dinner at the Trocadero Restaurant, on Wednesday, the 24th June. Lieutenant-Colonel J. F. Curtis-Hayward occupied the chair, and the company numbered about 40, including the following:—Major Craigie, C.B., A. D. Hall, A. Goddard, R. D. Cumberland-Jones, J. H. Oakley, A. T. Dickson, W. McCracken, A. H. Ashdown, A. L. H. Cleland, L. R. Goulton Constable, T. H. Spry, W. Baird, R. Shafto, A. G. Bloxam, W. Dickinson, J. G. Turnbull, S. R. Vernon, Bruce Swanwick, H. Donne, C. Wilkinson, G. J. M. Burnett, L. Sutton, T. L. Cholmondeley, F. Sutton, H. C. Waterfield, M. M. Hall, C. J. Bennett, G. W. Brewett, C. H. Hooper, T. B. Ward, James Edwards, J. Herbert Taylor, E. B. Haygarth, &c.

The Chairman proposed the usual loyal toasts in appropriate terms, and the toast of the Army and Navy was proposed by Mr Edwards, and responded to by Captain Vernon and Mr. Bennett.

The Chairman then proposed "Success to the Royal Agricultural College," giving a short history of the way in which the institution had acted as a pioneer in the promotion and carrying out of agricultural education in this country, and quoted as an interesting fact that so many prominent agriculturists of the day had commenced that line of work by a course of study at the R.A.C., and naming Sir Jacob Wilson as a notable instance.

In the absence of the Principal (who intended to be present, but was unavoidably prevented from coming), Mr. Haygarth responded to the toast.

The Chairman then proposed "The Board of Agriculture," with thanks for the energy displayed by that useful and necessary public body, especially considering the small amount of funds at their command.

Major Craigie and Mr. Goddard responded, Major Craigie stating that as a public servant he was not permitted to make remarks in regard to his department, but that personally he cordially appreciated the past and present work of the R. A. College. He remarked upon improved methods in the pursuit of agriculture enabling this country to produce and supply to her many Colonies a very large quantity of stock of the highest class, which was sure to be of great assistance to the Colonies and tend to encourage reciprocity of treatment.

Mr. Haygarth proposed "The Royal Agricultural Society," remarking upon its important functions and the new arrangement of holding the annual show on the permanent show ground, close to London, in which movement he hoped the Society would reap advantage. He coupled with the toast the name of Colonel Curtis-Hayward, a prominent member of the Council of the Society, and of several of the most important committees.

Colonel Curtis-Hayward in reply gave a short explanation of the weighty reasons which induced the Society to make the changes it had done.

Mr. Dickson proposed "The Visitors," and with that toast associated the name of Mr. Hall, the recently appointed director of Rothamsted, which had in the time of its management by Sir John Lawes and Sir Henry Gilbert so often given valuable assistance to the R.A.C.

Mr. Hall in response said that he hoped he should be able worthily to carry out the great and important trust reposed in him, and he would always be ready to render any assistance to the R. A. College that lay within his power. He expressed his admiration for the work which had been done by the R.A.C., and his confidence that if the authorities continued to act up to the traditions of that institution, they need not fear the competition of the newer growth of agricultural colleges.

The health of the Chairman was cordially received, and a very pleasant evening terminated.

FARM NOTES.

At sales of bloodstock at Newmarket, the end of June, Mr. Russell Swanwick sold Hellas (1896), by Amphion—Blavatsky, with a filly foal by St. Frusquin, and covered by Matchmaker, to Mr. Hemming for 1000 guineas.

At the sale of yearlings at Newmarket, on July 2nd, Mr. Russell Swanwick sold a colt, Rouge Croix, by Bend Or—Dame Agneta, for 310 guineas; a colt, Monsieur Beaucare, by Cyllene—Lady Cecil, for 750 guineas; and a filly, Ariadne, by Orme—Dame Masham, for 400 guineas.

On the same day a bay filly, the property of Mr. Bruce Swanwick, by Orvieto (sire of this year's Brocklesby winner), out of Salt of Sorrel (dam of Delia and Irresistible, winner of New Stakes and Alexandra Plate), was sold for 310 guineas.

DIPLOMA EXAMINATION.

At the Examination at the close of the Easter Session the following gained the Diploma of Membership:—Mr. T. A. Worsey, Mr. J. R. Eddison, Mr. T. H. Stockwell, and Mr. Elias Eliopoulos. The Ducie Gold Medal was awarded to Mr. Worsey, while Mr. Eliopoulos gained a Goldstand Silver Medal for distinction in Agricultural Chemistry.

Mr. T. W. Davies gained the Associateship.

Mr. James Sadler was the Examiner in Practical Agriculture.

OLD STUDENTS.

Mr. F. C. McClellan, M.R.A.C. (1892), has been appointed to the Professorship of Forestry at the Royal Agricultural College.

The King has been pleased to approve the appointment of Mr. Basil S. Cave, C.B., M.R.A.C. (1886), British Consul at Zanzibar, to the rank of Consul-General, on the recommendation of Lord Lansdowne.

Mr. Edmund Waller, M.R.A.C. (1898), has been appointed Agent for the Estates of Lord Aylesford in Warwickshire and Kent. The Estate Office is at Packington Hall, Coventry.

HONORARY PROFESSORSHIP.

The Honorary Professorship, vacant some time ago by the death of Sir Henry Gilbert, F.R.S., has now been filled by the appointment of Dr. W. Schlich, C.I.E., F.R.S., late Inspector-General of Forests, Government of India, and principal Professor of Forestry, Cooper's Hill.

CHLORINE IN RAIN WATER.

The rainfall for the six months ending March 31st was 15·95 inches, the water contained chlorides equal to ·46 grains of sodium chloride per gallon. This is equivalent to a deposit of 23·58 lbs. of common salt per acre.

For the twelve months ending at the same date the rainfall was 29·23 inches and the chlorides equivalent to a deposit of 56·44 lbs. of common salt per acre. This is above the average, but during several months strong south-west winds have prevailed, and when these are accompanied by rain the chlorides in the rain water are always high.

E. K.

EXAMINATION OF THE SURVEYORS' INSTITUTION.

At the late Examinations of this Institution the following students of the R.A. College passed :—Mr. P. T. Maw and Mr. F.A.S. Goodbody passed the Fellowship Examination; Mr. Maw obtaining the Penfold Gold Medal, and being bracketed equal for the Crawter Prize.

Messrs. H. B. Beddall, M.R.A.C., G. A. Lambert, M.R.A.C., P. J. Lindsell, M.R.A.C., F. H. G. Osmond-Smith, M.R.A.C., and E. M. Wason, M.R.A.C., passed the Examination for the Professional Associateship.

Mr. Percival T. Maw is the son of Mr. Charles Maw, of Nutfield, Surrey, and was born in 1878. After being at Harrow he came to the College in 1897. Later on he held an appointment connected with the estates of Lord Kenyon and others in Shropshire and North Wales; afterwards he was engaged on the estate of Sir John Cotterell in Herefordshire, and then on that of Lord Gerard in Kent. Mr. Maw is now taking part in the management of over 20,000 acres in Wiltshire.

THE THAMES.

We are informed that the original Thames Head Spring under Trewsbury Castle, on the south side of the canal, was running strongly on June 21st, and, probably, for two or three days previously. We believe that it is many years since this spring ran; it is probably forty years since it ran regularly, and, though we have no authentic records, the number of times it has run in the interval are very few indeed. Other springs on the north side of the Tetbury road were at the same time running, and contributing to the water of the Thames, which ran through the culvert under the road.

CRICKET.

Characters of the Team.

T. A. Scully.—Has proved himself a hard-working and capable captain; is smart in the field, and has had some success as a bat.

F. Scully.—Has been our mainstay both in batting and bowling.

G. Symons.—A careful bat, and a good man to go in first.
G. N. Dickin.—A very keen cricketer, and a reliable field.
R. Ratcliff.—Has come on wonderfully as a bat since last year, and very smart in the field.
G. May.—Has done little as a batsman, but has bowled very well at times.
E. Morrison.—Not a reliable bat, fields well at times.
F. Iredale.—Has made runs on more than one occasion and in good style.
G. Dobson.—An unreliable bat, and throws in badly.
W. H. Parker.—Has played for the 2nd XI. with considerable success.
H. Jung.—Has a good eye, and has on more than one occasion helped to put on runs for the last wicket.

R.A.C. v. East Gloucestershire.—This match was played on the home ground on the 30th of May, and resulted in a draw. The East Gloucestershire team turned up over an hour late, but a pleasant afternoon's cricket was enjoyed. The R.A.C. won the toss and batted first; 2 wickets were down for 16, but Dickin and T. A. Scully made a short stand, being separated at 47. Jung hit well for 13, and the innings terminated for 74, For the visitors S. N. Walker made 23. Score :—

R.A.C.	
G. Symons, b Creed	6
F. Scully, st Robertson, b Creed	9
G. Dickin, b Alton	19
T. A. Scully, c Walker, b Creed	17
G. May, b Alton	0
E. Morrison, b Alton	0
N. Robinson, b Creed	1
C. Cooke, b Alton	0
H. Jung, b Tillard	13
H. C. Bell, c Williams, b Alton	4
Varley, not out	0
Extras	5
Total	74

East Gloucestershire.	
J. Williams, b F. Scully	1
S. N. Walker, not out	23
J. H. Creed, c and b F. Scully	0
C. Tillard, b F. Scully	19
H. de Beauvais, lbw, b Dickin	2
S. D. Tillard, c and b Cooke	2
W. M. Robertson Alton Haddon Smith Iredale } subs Browne	Did not bat
Extras	13
Total (5 wickets)	60

R.A.C. v. Roseleigh.—This match was played at Cheltenham on June 17. Only half an hour's play was possible owing to a heavy thunderstorm. The R.A.C. batted first and scored 27 for 1 wicket (F. Scully 11, G. Dickin 12, extras 4).

R.A.C. v. East Gloucestershire.—Played at Cheltenham on June 27. The ground was very fast to which our men were unaccustomed. Luard, Clauss, and Walker batted well for East Gloucestershire. Score :—

R.A.C.	
G. Symons, c Hay, b Clarke	1
G. Dickin, c Butt, b Hay	0
T. Scully, lbw, b Hay	11
G. May, c Creed, b Clarke	0
H. Jung, b Hay	1
F. Iredale, b Clarke	3
N. Robinson, lbw, b Hay	1
R. Ratcliff, c Walker, b Clarke	9
H. Bell, c Creed, b Clarke	4
E. Morrison, b Clarke	0
Varley, not out	6
Extras	10
Total	46

East Gloucestershire.	
A. H. Luard, c May, b Varley	65
F. Williams, b Varley	14
F. H. Creed, run out	28
F. Clarke, c Varley, b Iredale	10
H. Clarke, c Dickin, b Scully	25
H. T. Hay, b Varley	13
P. Clauss, c Robinson, b Scully	44
S. Walker, c Jung, b Scully	45
W. Butt, not out	5
A. Denne, b Dickin	0
W. Robertson, not out	1
Extras	19
Total	269

R.A.C. v. Stroud.—This match was played on the Stroud ground on July 1st, and resulted in a win for the home team. Stroud had enlisted the services of Huggins, the Gloucestershire professional bowler, and put a strong team into the field. Stroud batted first and put together 248 runs. The R.A.C. fielded badly, catch after catch being missed behind the wicket and other parts of the field. Dickin, 35 not out, played a good innings for the College. Score :—

Stroud.		R.A.C.	
Huggins, b F. Scully	15	F. Scully, b Huggins	2
J. Stephens, c Robinson, b T. Scully	52	G. Dickin, not out	35
F. Warman, b F. Scully	14	T. Scully, b Poole	1
—. Holloway, b F. Scully	23	R. Ratcliff, b Huggins	4
L. E. Fawkes, c Dickin, b T. Scully	10	V. Lawson, c Warman, b Poole	18
D. McCormack, b F. Scully	9	G. May, b Huggins	3
C. M. Smith, not out	57	F. Iredale, b Huggins	0
Merrett, b Dickin	30	N. Robinson, b Poole	5
D. Warman, b Dickin	10	H. Jung, b Huggins	2
S. B. Darke, b T. Scully	7	G. Morrison, b Huggins	9
Poole, did not bat		Varley, c Smith, b Huggins	2
Extras	23	Extras	1
Total	248	Total	82

R.A.C. v. Cirencester.—Played in the Park on July 4th. The Town in this match went out of their way to put a very strong XI. in the field, by far the strongest they have played this season. The R.A.C. batted first and put together 141 runs, keeping the Town in the field for two and a half hours. F. Scully played a very fine innings, without a chance, for 50. G. Dickin and R. Ratcliff also contributed substantially to the score. The College could do little against the batting of the Town, who scored freely all round the wicket. Score :—

R.A.C.		Cirencester.	
G. Symons, c Howell, b Tovey	0	W. G. Tovey, c F., b T. Scully	78
F. Scully, b Tovey	50	T. H. Fowler, run out	55
G. Dickin, b Allen	23	C. Allen, b Varley	74
T. Scully, c Bishop, b Allen	6	S. Boulton, b T. Scully	37
G. May, b Allen	0	R. W. Ellett, not out	40
R. Ratcliff, c Allen, b Jennings	19	C. O. H. Sewell, not out	24
W. Parker, run out	0	G. H. Saunders Jennings H. W. Bishop H. L. Howell W. E. Midwinter	Did not bat
F. Iredale, b Allen	3		
N. Robinson, b Tovey	3		
H. Jung, b Tovey	0		
Varley, not out	0		
Extras	37	Extras	6
Total	141	Total (4 wickets)	314

R.A.C. v. Cheltenham.—This match was played at Cheltenham on July 8, and resulted in a win for the home team. The College batted first and put together 135 runs. T. H. Fowler played a fine innings for 42, but was run out through mistaking one of the field for the umpire. On Cheltenham going in to bat, Wrathall, the Gloucester county pro., whose services they had secured, hit with much freedom, being not out at the drawing of stumps for 205 runs. Score :—

R.A.C.		Cheltenham.	
T. H. Fowler, run out	42	Wrathall, not out	205
F. Scully, c Boroughs, b Woof	20	Woof, b F. Scully	1
G. Dickin, run out	23	A. A. Dighton, c Varley, b F. Scully	17
T. Scully, c Boroughs, b Mills	10	H. Margrett, c F. Scully, b Varley	1
G. Symons, not out	14	J. B. Champain, b Varley	23
R. Ratcliff, c Butt, b Woof	3	Boroughs, not out	26

G. May, b Mills	0	E. Barnett	Did not bat
G. Dobson, b Mills	5	Mills	
F. Needham, b Mills	3	F. M. Norman	
H. Jung, c Dighton, b Mills	9	W. Butt	
Varley, b Mills	4	H. Chester	
Extras	2	Extras	8
Total	135	Total (4 wickets)	281

R.A.C. v. Roseleigh.—This match was played at the College on July 25th, and resulted in a draw. Roseleigh won the toss and put the College in first. T. A. Scully and F. Scully put on 88 for the second wicket before the latter was caught at the wicket. G. Symons played steadily for 27, and Iredale hit well for 26. On Roseleigh going in Brewster hit up 83 in fine style, but little was done by the rest. Score :—

R.A.C.		Roseleigh.	
F. Scully, c Steppings, b Matthews	40	Steppings, c Varley, b F. Scully	15
G. Dickin, st Steppings, b Daunter	2	Wells, b Varley	3
T. Scully, b Shephard	58	Brewster, c T. Scully, b Varley	83
G. Symons, c Steppings, b Shephard	27	Elmes, c Jung, b Dickin	8
R. Ratcliff, b Shephard	2	Matthews, b F. Scully	13
G. Morrison, run out	5	Hicks, b F. Scully	4
F. Needham, b Hicks	1	Daunter, b F. Scully	0
G. Dobson, c Daunter, b Shephard	12	Shephard, not out	15
F. Iredale, not out	26	Caudle, not out	8
H. Jung, b Hicks	0		
Varley, c Matthews, b Hicks	10		
Extras	17	Extras	13
Total	200	Total (7 wickets)	162

R.A.C. Past v. Present.—Played on July 22 and 23 on the College ground. Owing to Old Students scratching at the last moment, the Past turned up three men short ; their places were, however, ably filled by W. Bell, H. Browne, and H. C. Bell. On account of the weather on the first day, play was not possible till 2 p.m., when a start was made. The Present won the toss and batted first on a slow and wet wicket ; runs came very slowly owing to the nature of the ground. F. Scully played a careful innings for 61, being caught in the long field. G. Dickin, F. Iredale, and H. Jung all batted freely. For the Old Students E. Henry and H. C. Salt each compiled 33, but little was done by anybody else for the Past, whose innings terminated for an aggregate of 104. On the 23rd play was commenced at 11.30 a.m. The Present commenced their second innings at 12.30, but could do little against the bowling of the Past on a very difficult wicket, and were all out for 73 runs. The Past again went in, but rain stopped further play after a few minutes' batting. A very even match had therefore to be abandoned as a draw. Score :—

Present.

F. Scully, c O. Smith, b Henry	61	c and b Salt	1
G. Symons, c Walford, b Henry	0	b O. Smith	6
G. Dickin, b W. Bell	38	lbw, b Salt	8
T. Scully, b O. Smith	0	c Goodbody, b Henry	13
R. Ratcliff, b O. Smith	0	b Salt	17
F. Iredale, run out	26	hw, b O. Smith	2
G. May, b Ward	1	run out	1
E. Morrison, st Walford, b Henry	10	st Walford, b Henry	8
H. Dobson, b Henry	0	not out	0
W. Parker, not out	8	b Henry	8
H. Jung, st Walford, b Henry	18	b Salt	4
Extras	8	Extras	4
Total	170	Total	73

PAST.

F. Ward, lbw, b F. Scully...	8		
F. Goodbody, b F. Scully ...	1		
E. Henry, c Ratcliff, b May	33	not out	18
E. Walford, b F. Scully ...	0		
D. Hervey, c Jung, b F. Scully	7		
H. C. Salt, not out ...	33		
S. Burrell, c Jung, b F. Scully	2	not out	3
F. H. Osmond Smith, b May	0		
W. Bell, b May	2		
H. Browne, b May ...	3		
H. Bell, b May	0		
Extras	15	Extras	8
Total	104	Total (no wicket)	29

BOWLING ANALYSIS.

Present.

F. Scully	5	wickets for	63	runs
G. May	5	,,	11	,,

Past.

E. Henry	8	wickets for	98	runs
H. C. Salt	4	,,	52	,,
F. Ward	1	,,	8	,,
F. H. O. Smith	3	,,	13	,,
W. Bell	1	,,	15	,,

R. A.C. v. GLOUCESTER.—This match was played on the Gloucester county ground on July 25, and resulted in a draw. Gloucester won the toss and went in first. They played very slow cricket on a fairly fast wicket, only 30 runs being scored in the first 45 minutes. With 155 on the board for 3 wickets they declared, and with an hour and a half to bat the R.A.C. had made 54 for the loss of 2 wickets when rain stopped further play. Gloucester had enlisted the services of F. B. Roberts, the Cambridge blue. Score :—

GLOUCESTER.

F. Tandy, c Walford, b F. Scully...	27
H. Ford, c Walford, b F. Scully ...	29
F. B. Roberts, not out	44
W. Palmer, lbw, b F. Scully	5
G. Romans, not out...	33
P. Ford	Innings declared Did not bat
F. N. Fox	
H. W. Arkell	
T. B. Powell	
E. Ryder	
Bewick	
Extras	17
Total (3 wickets)	155

R.A.C.

G. Symons, not out ...	23
F. Scully, c Tandy, b Roberts	8
G. Dickin, c Fox, b Bewick	11
T. Scully, not out ...	0
E. Walford	Did not bat
R. Ratcliff	
F. Iredale	
G. May	
G. Dobson	
H. Jung	
Varley	
Extras	12
Total (2 wickets)	54

SECOND ELEVEN.

The second eleven, with H. G. Browne as captain, have had a fairly successful season, winning three matches and drawing one out of nine played. Want of space prevents our giving a full account of these games.

The R.A.C. season not being completed as we go to press, we will give the concluding matches and the batting and bowling averages in our next issue.

LAWN TENNIS.

The "Six" for this summer is composed as follows:—G. Dickin (captain), Prof. Locke, Prof. West, T. A. Scully, H. Mathews, and N. Robinson.

R.A.C. v. Swindon.—Played at R.A.C. on June 6th, the College losing 5 matches to 4.

G. N. Dickin and T. A. Scully	lost to —. Stote and C. Wood		1—6	6—8
	beat —. Pritchard and —. Rose		6—1	6—1
	beat J. Pearson and C. E. Spurgeon		6—0	6—1
Prof. Locke and H. S. Mathews	lost to Stote and C. Wood	4—6	6—4	2—6
	beat —. Pritchard and —. Rose		6—1	6—3
	beat J. Pearson and C. E. Spurgeon		6—1	6—4
Prof. West and C. A. Cooke	lost to —. Stote and C. Wood		1—6	2—6
	lost to —. Pritchard and —. Rose		1—6	4—6
	lost to J. Pearson and C. Spurgeon	7—5	4—6	1—6

R.A.C. v. Mr. Ross-Hume's VI.—Played at the R.A.C. on Thursday, June 18th, Ross-Hume's VI. winning by 5 matches to 4.

G. N. Dickin and Prof. Locke	lost to Revs. Dashwood and Evans		2—6	7—9
	beat J. Ross-Hume and D. Mildred	6-4	3—6	6—1
	beat Rev. Amphlett and C. Lawrence		6—2	6—4
T. A. Scully and Prof. West	lost to Revs. Dashwood and Evans		5—7	1—6
	lost to J. Ross-Hume and D. Mildred		2—6	4—6
	beat Rev. Amphlett and C. Lawrence		6—4	6—4
H. S. Mathews and C. A. Cooke	lost to Revs. Dashwood and Evans		2—6	3—6
	lost to J. Ross-Hume and D. Mildred		4—6	5—7
	beat Rev. Amphlett and C. Lawrence		6—4	6—4

R.A.C. v. Mr. Ross-Hume's VI.—Played at the College on July 9th, the R.A.C. winning 6 matches to 3.

G. N. Dickin and Prof. Locke	lost to Revs. Dashwood and Evans		4—6	4—6
	beat Revs. Amphlett and Burra	1—6	6—3	6—2
	lost to J. Ross-Hume and Rev. Tyler		3—6	4—6
T. A. Scully and Prof. West	lost to Revs. Dashwood and Evans	1—6	6—2	3—6
	beat Revs. Amphlett and Burra		8—6	6—2
	beat J. Ross-Hume and Rev. Tyler		13—11	6—2
H. S. Mathews and C. A. Cooke	lost to Revs. Dashwood and Evans		4—6	1—6
	lost to Revs. Amphlett and Burra		0—6	0—6
	lost to J. Ross-Hume and Rev. Tyler		3—6	4—6

R.A.C. v. Swindon.—Played at Swindon on July 11th, the home team winning 6 matches to 3.

T. A. Scully and Prof. West	lost to Bentley Taylor and C. Wood		1—6	2—6
	beat —. Stote and —. Reid	13—15	6—1	6—4
	beat F. Luxmoore and J. Pearson		6—2	6—0
G. N. Dickin and Prof. Locke	lost to Bentley Taylor and C. Wood		3—6	3—6
	lost to —. Stote and —. Reid	6—3	8—10	4—6
	beat F. Luxmoore and J. Pearson		6—2	6—0
H. Mathews and H. Middleton	lost to Bentley Taylor and C. Wood		0—6	0—6
	lost to —. Stote and —. Reid		3—6	1—6
	lost to F. Luxmoore and J. Pearson		3—6	1—6

R.A.C. v. EAST GLOUCESTERSHIRE.—Played at Cheltenham on Wednesday, July 15th, the College losing by 8 matches to 1.

Prof. Locke and H. Mathews	lost to Capt. Henderson and —. Forster	3—6 1—6
	lost to R. C. West and A. Cheales	2—6 0—6
	beat J. Farran and L. Hodson	7—5 4—6 6—1
Prof. West and H. Middleton	lost to Capt. Henderson and —. Forster	2—6 2—6
	lost to R. C. West and A. Cheales	1—6 1—6
	lost to J. Farran and L. G. Hodson	2—6 2—6
N. Robinson and C. A. Cooke	lost to Capt. Henderson and —. Forster	0—6 3—6
	lost to R. C. West and A. Cheales	1—6 0—6
	lost to J. Farran and L. G. Hodson	1—6 1—6

R.A.C. v. EAST GLOUCESTERSHIRE.—Played on Thursday, July 16th, at the College, the R.A.C. winning 5 matches to 3 (1 abandoned).

T. A. Scully and Prof. West	lost to Capt. Henderson and —. Farran	4—6 4—6
	v. N. Lee and T. A. Hodson	(walk over)
	beat Stafford-Greene and —. Meade	6—2 7—5
G. N. Dickin and H. Mathews	beat N. Lee and T. Hodson	9—7 9—11 6—1
	v. Capt. Henderson and —. Farran	13—14 (abandoned)
	v. Stafford-Greene and —. Meade	(walk over)
Prof. Locke and N. Robinson	lost to Capt. Henderson and —. Farran	0—6 3—6
	lost to N. Lee and T. Hodson	6—1 3—6 4—6
	beat Stafford-Greene and —. Meade	7—5 7—5

R.A.C. v. MR. F. H. O. SMITH'S VI.—Played at the R.A.C. on July 20th, the College winning 6 matches to 3.

G. N. Dickin and H. Mathews	beat	6—2 6—1
	beat Rev. Burra and —. Robinson	6—3 6—2
	beat F. H. O. Smith and E. Ball	6—1 6—4
T. A. Scully and Prof. West	lost to	6—1 4—6 5—7
	beat Rev. Burra and —. Robinson	6—4 6—2
	beat F. H. O. Smith and E. Ball	6—3 6—2
Prof. Locke and N. Robinson	lost to	6—3 6—1
	lost to Rev. Burra and —. Robinson	6—8 3—6
	beat F. H. O. Smith and E. Ball	6—3 6—4

R.A.C. PAST v. PRESENT.—Played on Friday, July 24th, on Mr. Swanwick's and the College courts, the Past winning 5 matches to 4.

G. N. Dickin and H. Mathews	lost to Haskett Smith and F. Ward	6—4 3—6 1—6
	beat J. Ross-Hume and H. Patten	6—4 6—4
	beat Wallis-Wilson and E. Walford	6—2 6—0
T. A. Scully and Prof. Locke	lost to Haskett Smith and F. Ward	2—6 0—6
	beat J. Ross-Hume and H. Patten	6—3 6—4
	beat Wallis-Wilson and E. Walford	7—5 6—0
Prof. West and N. Robinson	lost to Haskett Smith and F. Ward	0—6 0—6
	lost to J. Ross-Hume and H. Patten	1—6 6—3 9—11
	lost to Wallis-Wilson and E. Walford	4—6 6—8

An interesting paper by the Rev. H. Stevens-Guille is unavoidably held over till our next issue.

WAKEFIELD AND SON,
Tailors & Breeches Makers,
Hosiers, Glovers, Hatters.

Perfect Fitting.
Ease in the Saddle.

Agents for "Burberry" Waterproof Materials and Coats.

R. A. COLLEGE BLAZERS, RIBBONS, SCARVES AND TIES, &c.

PERSONAL ATTENTION TO FOREIGN & COLONIAL ORDERS.

Patterns and Self-measurement Forms.

Market Place, Cirencester.

Extract from
The R.A.S. of England Journal.
Vol. II. of Series 3, page 192.

"Permanent & Temporary Pastures."

By MARTIN J. SUTTON, F.L.S.

"THE book is, in its entirety, a happy illustration of 'Practice with Science.' Primarily, it is a practical book written by a practical man for practical men. But Science, as the handmaid of Practice, sheds her light upon its pages, and the result is in the highest degree instructive. The early chapters deal with the drainage of grass land, cultural preparations, and the selection of grasses and clovers. The main part of the book is then occupied with descriptions of the species of plants commonly found in meadows and pastures. Next follow instructions for the spring and autumn sowing of grass seeds and the immediate after-management of new pastures."

Sixth edition, bound in cloth, 5s.

Through all Booksellers from

SIMPKIN, MARSHALL, HAMILTON, KENT & Co., LIMITED,
LONDON;

Or may be obtained direct from SUTTON & SONS, Reading.

Printed and Published for the Proprietors by GEORGE HENRY HARMER, at the Office,
Lewis Lane, Cirencester, AUGUST, 1903.

LIBRARY
DEC 1 - 1914
Agricultural College

NEW SERIES.
Vol. XI. Part 6. APRIL, 1904. Price 1s.

THE LIBRARY OF THE
DEC 4 - 1930
UNIVERSITY OF ILLINOIS

AGRICULTURAL STUDENTS' GAZETTE.

EDITED BY

STUDENTS AT THE ROYAL AGRICULTURAL COLLEGE,
CIRENCESTER.

CONTENTS.

PAGE
The Thames Head: and the Head of the Thames. With illustration. E. Kinch 163
The Organisation of Agriculture. Ben. Bathurst, M.R.A.C., M.P. 167
Visit to Klondyke. Gerald Spring Rice 170
The New Movement in Ireland. Bruce Swanwick, M.R.A.C. 174
Poultry Farming. Fred. H. Weber 181
Advice to Pupils. A. G. Weigall, M.R.A.C. ... 183
Vaccination against Blackquarter. W. T. Wilson, F.R.C.V.S. 185

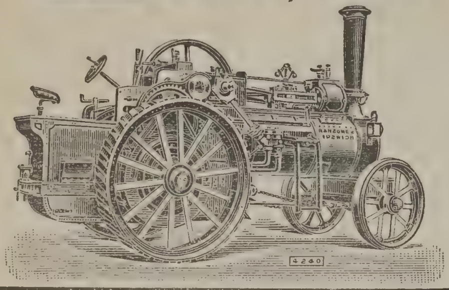
PAGE
College Notes 187
Obituary 187
Athletic Sports 187
R.A.C. College Sports Records 190
Old Students 190
Diploma Examination ... 190
Scholarships 190
Chlorine in Rain Water. E. K. 191
R. A. C. Point-to-Point Steeplechases 191
Football 191
R.A.C. Beagles 192
Golf 193
Billiards 193
Reviews 193

ALL RIGHTS RESERVED.

CIRENCESTER: ALFRED T. HARMER, MARKET PLACE.

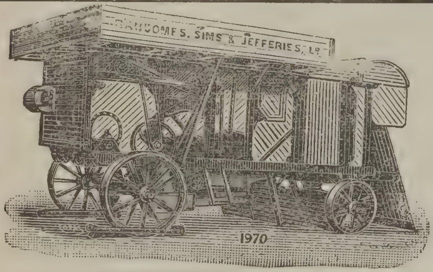
APPOINTED BY ROYAL WARRANT MANUFACTURERS OF AGRICULTURAL MACHINERY
TO HIS MAJESTY KING EDWARD VII

RANSOMES, SIMS & JEFFERIES, LD.



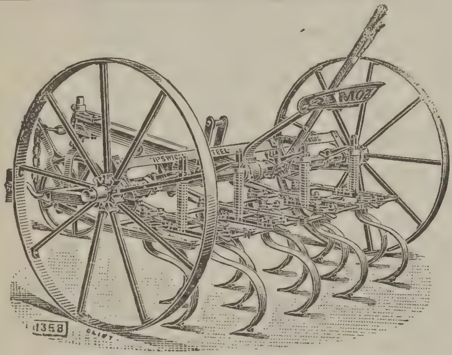
MANUFACTURE THE BEST
TRACTION ENGINES,
PORTABLE ENGINES,
VERTICAL ENGINES,
HORIZONTAL ENGINES
AND BOILERS.

Excellent designs, first-class materials and workmanship; ample strength in all working parts; large bearings and cylinders; ample steam space.



FINISHING
STEAM THRASHING MACHINES.

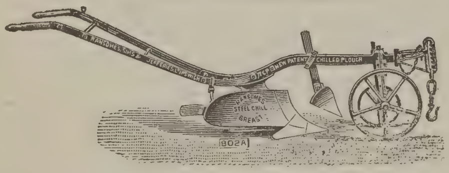
R., S. & J. have supplied Thrashing Machines to HIS MAJESTY THE KING, for the Sandringham Estate, and to the late QUEEN VICTORIA, for the Prince Consort's Shaw Farm, Windsor.



"THE IPSWICH"
STEEL CULTIVATOR.

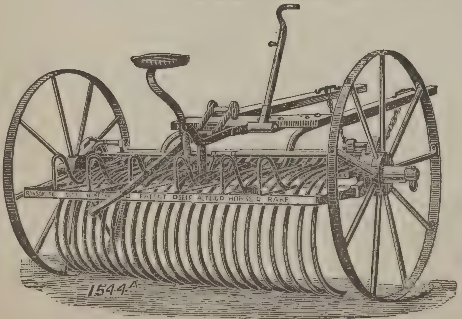
The strongest, best, and most perfect Machine in the market. The spring of the teeth keeps everything alive. Can be fitted for two or three horses.

Also
"SMALL HOLDINGS" and
"TRIPLEX" CULTIVATORS.



IRON AND WOOD PLOUGHS,
2 AND 3 FURROW PLOUGHS,
CHILLED DIGGING PLOUGHS.

R., S. & J., Ld., have been manufacturers of Ploughs for nearly a century, and the Chilled Plough Share was invented by Robert Ransome in 1803.



NEW "G.M.C." GENERAL PURPOSE RAKES.
THROUGH AXLE RAKES.
SELF-ACTING & MANUAL RAKES.
HAYMAKERS.
SWATHERS, &c.

◆ ◆ ◆

FULL ILLUSTRATED CATALOGUES
FREE BY POST ON APPLICATION.

◆ ◆ ◆

ORWELL WORKS, IPSWICH.

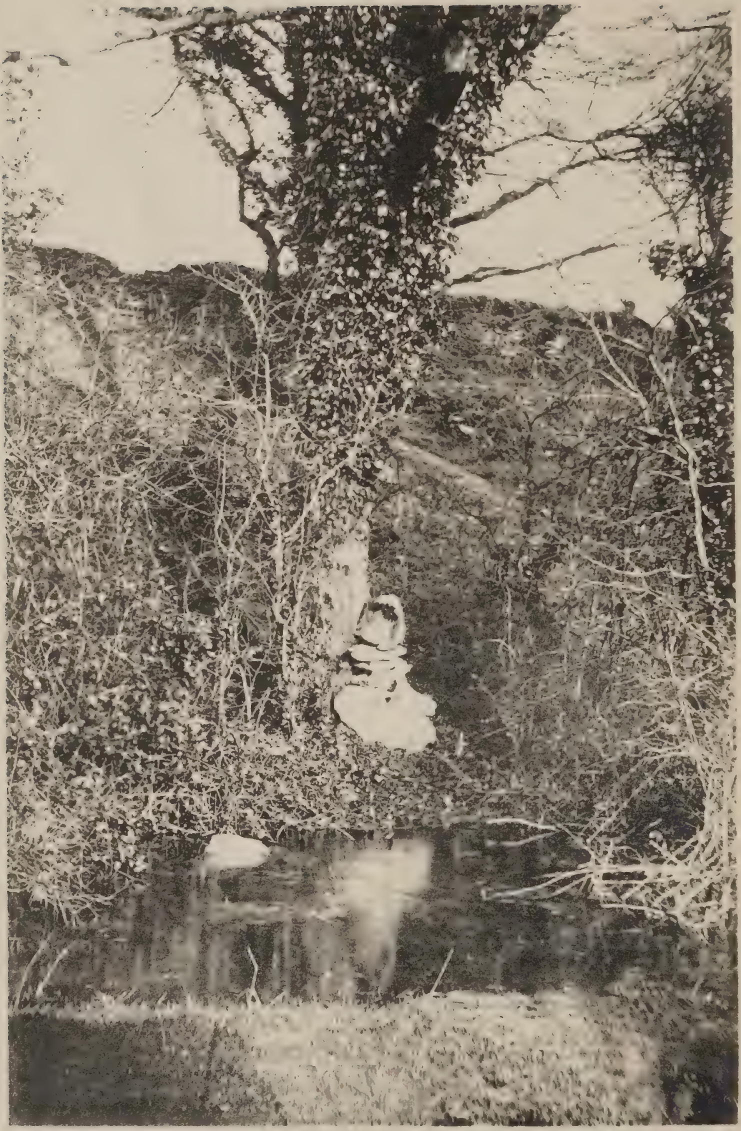


Photo by W. D. STEVENS. *February 17th, 1904.*

THE THAMES HEAD.

TREWSBURY MEAD, COATES, NEAR CIRENCESTER, GLOUCESTERSHIRE.

NEW SERIES.

Agricultural Students' Gazette.

VOL. XI. APRIL, 1904. No. 6.

OF THE UNIVERSITY OF ILLINOIS

The Thames Head:

AND THE HEAD OF THE THAMES.

It is usual to speak of the source of a river as the spring farthest from its mouth; in that case the head of the Thames is at the Seven Springs at Cubberley, about three miles from Cheltenham. This, which is the head of the Churn, is several miles (about ten) further from the mouth of the Thames than is "Thames Head" near Cirencester.

There is, however, a consensus of old writers, old documents, and old maps in fixing the "Thames Head" at the spring in Trewsbury Mead, a picture of which, due to the kindness of a present student of the R. A. College, we give in this issue.

Thus John Leland, who wrote about the middle of the sixteenth century *De Rebus Britannicis Collect.* and *Itineraries*, in Vol. V. of the latter writes :—"*Isis* riseth a iii. Myles from *Cirencestre* not far from a Village cawlled *Kemble* within half a Myle of the *Fosse Way*, betwixt *Circecestre* and *Bath.* Thens it runneth to *Latinelad* a 4 [6] Myles of, and so to *Crekelad* about a Myle lower, sone after receyving *Churn.*"

. . . .

"Wher as the very Hed of *Isis* ys in a great Somer Drought apperith very little or no Water, yet is the Stream servid with many of springes resorting to one Botom."

From Camden we learn that—"The river *Churne* when it hath left *Circester* behind him, six miles, neere to *Dounamveny* an ancient seat of the *Hungerfords*, joineth with ISIS. For ISIS, commonly called Ouse, that it might bee by originall of *Gloucestershire*, hath his head there, and with lively springs floweth out of the South border of this shire near unto *Torleton* an upland village, not far from that famous *Portway* called the *Fosse.* This is that *Isis* which afterwards entertaineth *Tame*, and by a compound word is called *Tamisis*, Soveraigne as it were of all the Britain Rivers in Britaine: of which a man may well and truly say as ancient Writers did of *Euphrates* in the East part of the World: that it doth both Sow and Water the best part of Britaine. The poeticall description of whose Source or first head, I have heere put down out of a Poem entituled *The Marriage of Tame and Isis*, which whether you admit or omit skilleth but little."

We spare our readers a portion only of the poem and its translation.

"Lanigeros quà lata greges Cotswaldia pascit,
Crescit et in colles faciles, visura Dobunos,
Haud procul à *Fossa* longo spelunca recessu

Cernitur, abrupti surgente crepidine clivi:
Cujus inauratis resplendent limina tophis,
Atria tegit ebur, tectumque Gagate Britanne
Emicat, alterno solidantur pumice postes.

. . . . .

Undoso hic solio residet regnator aquarum
ISIS, fluminea qui majestate verendus
Cæruleo gremio resupinat prodigus urnam
Intonsos crines ulvis et arundine cinctus,"

. . . . .

"Where *Cotswold* spred abroad doth lie and feed fair flocks of sheepe,
And *Dobunes* for to see in downes ariseth nothing steepe,
Within a nouke along not much the *Fosse* and it betweene,
Just at the rising of a banke upright, a Cave is seene,
Whereof the entry glistereth with soft stones richly guilt,
The Haull is seel'd with Ivory, the roufe aloft ybuilt
Of Geat the best that Britaine yeelds: The pillers very strong,
With Pumish laid, each other course are raised all along.

. . . . .

In waiving *Throne* here sits the King of Waters all and some
ISIS, who in that Majestie which Rivers doth become
All rev'rend, from his watchet lap powr's forth his streame amaine
With weed and reed his haires tuckt up that grow both long and plaine,"

Camden's Britannia was first published in 1586, and a first edition of the translation into English, by Philemon Holland, Doctor of Physick, published in 1611, but this edition the translator regrets was full of mistakes owing to his being "farre absent from the Presse."

The second translation from which we have extracted is entitled *Britain, or a Chorographicall Description of the most flourishing Kingdomes, England, Scotland, and Ireland, and the Islands adjoyning;* written first in Latine by William Camden. Translated newly into English by the above translator. London: Printed by F. K. R. Y. and I. L. for William Aspley, 1637.

Spellings in the accompanying map are Ciciter, Cirencester; Cotes; and Torlton. The modern spelling of the latter is Tarlton.

The translation given in Rudder, quoted as from the *Britannia* (obviously another edition), is:

"Where Cotswold's hillocks, famed for weighty sheep,
Their eager course to the Dubonians keep;
Near the great fosse a spacious plain there lies,
Where broken cliffs the secret top disguise.
Huge free-stones neatly carv'd adorn the gate }
The porch with ivory shines, the roof with jeat, }
And rows of pumice in the posts are set. }
But nature yields to art: the workman's skill
Does free-stone, ivory, pumice, jeat, excel.

. . . . .

Here awful Isis fills his liquid throne ;
Isis, whom British streams their monarch own.
His never-wearied hands a spacious urn,
Down on his azure bosom gravely turn,
And flags and reeds his unpoll'd locks adorn.
Each waving horn the subject stream supplies,
And grateful light darts from his shining eyes.
His grizzly beard all wet hangs dropping down,
And gushing veins in wat'ry channels run.

From *A New History of Gloucestershire.* Cirencester: Printed by Samuel Rudder. 1779. pp. 47, 48 :—

" The Isis. This river has generally been considered as the head of the Thames, which, according to the current opinion, had that name from the junction of the names of the two rivers, Thame and Isis, as their waters also join near Dorchester, in Oxfordshire. But however plausible this etymology may seem, the learned author (1) of the additions to Camden's *Britannia* has made it appear that this river, which Camden and others have called *Isis* and *Ouse* was antiently called *Thames* or *Tems* before it came near the *Thame*, and produces the following authorities.

' " In an antient charter granted to Abbot Aldhelm, there is particular mention made of certain lands upon the east part of the river, *cujus vocabulum TEMIS, juxta vadum qui appelatur Summerford*, and this ford is in Wiltshire. The same thing appears from several other charters granted to the Abbey of Malmesbury, as well as that of Evesham ; and from old deeds belonging to Cricklade. And perhaps it may with safety be affirmed that in any charter or authentic history, it does not ever occur under the name of *Isis*; which indeed is not so much as heard of but among scholars ; the common people, all along from the head of it to Oxford calling it by no other name but that of *Thames.*

' " So also the Saxon *Temese* (from which our Tems immediately comes) is a plain evidence that that people never dreamt of any such conjunction. But further : all our historians who mention the incursions of Æthelwold into Wiltshire A.D. 905, or of Canute A.D. 1016, tell us that they passed over the Thames at Cricklade."

' " As for the original of the word [Thames] it seems plainly to be British, because there are several rivers in several parts of England of almost the same name with it ; as *Tame* in Staffordshire, *Teme* in Herefordshire, *Tamar* in Cornwall, &c. And a learned person of that nation [Mr. Lhwyd] affirms it to be the same with their *Taf*, which is the name of many rivers in Wales ; the Romans changing the pronunciation of the (*f*) into (*m*), as the Latin word *Demetia*, is in the Welch *Dyfed.*"—*Camden's Brit. Col. 100, 101.*'

" The Thames has been reputed to rise in the parish of Coats, out of a well that overflows in the winter, or in a very wet season only ; but in the summer this river can be traced no higher than to some springs which rise in the parish of Kemble, a little south of the foss road."

---

(1) Bishop Gibson, 1695.

"The Churn is another river, more antiently written, in composition, *Ceri*, *Cori*, *Corin*; as *Caer-Cori*, &c. The name is of British original; *Chwyrn*, in that language signifies rapid. The river rises at Cubberley, ten miles north of Cirencester, and passing thro' that town, joins the Thames near Cricklade; and may with great propriety be called the head of that river, being the highest source from whence it derives its water."

Another writer suggests another meaning of the word Churn:—"but Henry of Huntingdon mentions it under the name of Caer Cori; probably a contraction of Caer Coryn; an appellation apparently derived from the situation of the town on the Coryn, now called the Churn, which rises in the Cotswold Hills, and flows into the Thames near Cricklade. Coryn in the British language, signifies the top, or summit, and is very properly applied to this river, because it is the highest source of the Thames."—*The New British Traveller*, by James Dugdale; Vol. II., p. 443. London, 1819.

Mr. and Mrs. S. C. Hall in their *Book of the Thames* (2) mention other documents in which the river near or above Oxford is called *Tamisa*, *Tamesa*, *Tamesia*, *Tamesis*, and in Saxon always *Temese*: whilst the name Isis never occurs in ancient documents.

Camden's origin of the word is clearly fanciful, and the word Isis (3) was probably invented by an Oxford scholar; it is used in the sixteenth century by Leland, and he quotes a still older use of the word; but it seems never to have been used by the inhabitants on its banks.

The Thames in former centuries seems to have behaved much as it does in modern days, except that it now perhaps rather less frequently rises at the Thames Head spring, Coates, there having been many recent years in which this has not run at all. Its usual source is a spring about half a mile to the south of Acman Street, below the Thames Head pumping station for the Thames and Severn Canal. In some of the late dry summers the rise has been at a spring in the bed of the river itself, in Ewen, at a horseshoe bend, where there is a junction of the Forest Marble and Corn-brash. This spring we have never seen fail: it is some four miles below the top spring.

One of the latest writers on the subject, J. Ashby-Sterry, in *A Tale of the Thames* (London: Sands and Co., 1903), tells us—

> "The best of authorities all are agreed
> The source of the Thames is in Trewsbury Mead."

The "Thames Head" is certainly there.

E. Kinch.

---

(2) *The Book of the Thames, from its Rise to its Fall.* By Mr. and Mrs. S. C. Hall. Second edition. London: Virtue and Co., 1877.

(3) Latinised from the Celtic *uisc*, water, and now existing as Esk, Exe, and Usk. *Cf. Uisce bagh*, usquebaugh, whisky.

THE ORGANISATION OF AGRICULTURE.

The subject on which I have been asked to write is one of which it may be safely said, especially with regard to England, that it has a future before it. It is now every day becoming more and more important that those who are interested in agriculture, to whatever class of the community they may belong, should make up their minds to combine if they wish to keep the industry going at all.

What are the present circumstances? It is a sad fact that we in England import from abroad agricultural products and manufactures that might be made to pay if grown or made at home. Bacon, butter, eggs, poultry, and honey, to name only a few of them, figure in the list of imports to our country, and the money paid for them goes to circulate and benefit the industrious peasantry of France, Denmark, and other countries. Holland is even sending us fresh milk! But it is also a fact that many people living in the country have great difficulty in getting fresh milk, butter, and eggs. Let us take one example.

Some little time ago a friend of mine tried to go in for poultry. He showed his stock to the manager of the local hotel and other would-be likely purchasers; he was told that he could get a good price if there was a good constant supply, but unluckily he was unable to keep up his beginnings, and found that it was not possible for him to supply continually the quantity and quality required. Yet I cannot help thinking that by combination such a supply could be got, and that by good organisation the market could be furnished by home producers.

Denmark has been mentioned as the source of a great many of the agricultural products imported by us. The story of the beginning of the co-operation principles on which the industry is conducted is interesting, and I think bears a moral. It was in 1864, after the German war, that a clergyman in Denmark found that his church was ill attended, and so he commenced a series of lectures in a warehouse. One of his congregation said to him that it was all very well for him to preach of the happiness of the next world, but he thought he would also be doing good if he told them how to get more of the necessaries of this life. The words bore fruit, for the clergyman studied the Rochdale co-operation system, and from the small beginning in 1866 the growth of co-operative societies had reached the total in 1902 of 900 societies with a membership of 140,000. It may be stated that the whole population of Denmark is only about two millions, and that the town districts only boast of eight associations with a membership of 4,600.

There is just one further point about the products of Denmark which is most striking. The three chief articles supplied to our market by Denmark are butter, bacon, and eggs. In 1901, the figures were:

	Quantity.	Price above the average imports.	Difference in the aggregate.
Butter	162,140,000 lbs.	1¾d. per lb.	£1,150,000
Bacon	107,682,000 lbs.	2d. per lb.	£900,000
Eggs	362,300,000	1¾d. per doz.	£220,000

so that by the extra quality of the articles the peasant producers have profited by over 1¼ million pounds.

Having shown the success of the scheme, one or two words must be said on the method. With regard to the butter, the uniformity of quality is due to the regular mode of making and the interest that each farmer has in sending the best milk from the best cows to the central factory.

The bacon is produced in factories and slaughter-houses on the co-operative principle, and these farmers' slaughter-houses have increased from 1 in 1888 to 26 in 1901, the pigs alone slaughtered numbering 57,000 in the former year and 2,100,000 in the latter.

As to the egg industry, it is only quite a modern idea, for in the early 80's the value of the eggs imported from Denmark did not amount to anything very considerable. In 1894 the idea was formed to capture the English market, and in the next year the Danish Egg Export Company was formed with 30,000 shareholders. The Company went into all details, and a great deal of trouble is taken to secure nothing but the freshest eggs—all being dated—and the sender of a bad egg is severely dealt with. The result has been that in 1901 the value of the eggs exported from Denmark to England was £1,105,000, of which the co-operative societies are estimated to have received £333,000.

Having thus said a few words of Denmark and the co-operative movement with special regard to agriculture, let us turn our attention to this country. It is not within the scope of my paper to deal with co-operation and organisation of agriculture in Ireland, but it is impossible to deal with this subject without one word of reference to the increasing success of Mr. Horace Plunkett's scheme, and to acknowledge that Ireland is somewhat ahead of England in this matter.

The first serious attempt on a large scale to organise the industry was Lord Winchilsea's National Agricultural Union. By, as it were, unfurling the standard and asking the community to rally round, the promoter of the scheme hoped to do all classes a benefit and to increase the production of all things agricultural. Unfortunately the experiment cannot be said to have been successful, nor can the aims of the founder be said to have been achieved. The National Agricultural Union and the British Agricultural Organisation Society are now merged in the Agricultural Organisation Society, to which we may wish a successful career. It is, I think, but just criticism to say that whereas the National Agricultural Union rather took it for granted that the farmers could and would supply the goods required to the central depôt, the present Society rather aims at giving advice to farmers who are anxious to combine, and they encourage the formation of societies in localities, the management being also local. The Society is particularly careful to say that it is not a company trading for profit, but it assists in the formation of co-operative societies registered under the Industrial and Provident Societies Act, by which limited liability is secured. They further set out as the principal objects—

(1) To aid the farmer in securing the best market for purchase and sale.
(2) To improve the quality and increase the quantity of farm products.
(3) To direct agricultural trade into profitable channels.
(4) To stop the "cornering" of his produce by middlemen.
(5) To secure a reduction of railway rates.
(6) To educate the farmer in self-help.
(7) To secure purity of feeding stuffs, seeds, and manures.
(8) To provide up-to-date machinery for farmers.
(9) To improve live stock by the co-operative ownership of pedigree bulls, &c.
(10) To point out to the farmer that he cannot afford to "buy retail and sell wholesale."

It would seem that at length the necessity of the case has made itself felt, and branches are now being started in many places.

At Darlington there is a Farmers' Auction Mart, which was formed in 1893. The Company has a capital of £3,000 in £1 shares, and 230 members, who receive now 10 % dividend on their money. The animals of the members are catalogued and sold by a servant of the Company, being paid for immediately. The annual business after 10 years had risen to £120,000.

In this instance a very important point is shown, viz., the benefit of immediate payment. When one thinks of the ordinary way that stock is sold and paid for there is in a great many cases delay. Under the scheme of the Farmers' Auction Mart the money is paid on security of the Company's fund, and although the purchasers may not pay "on the nail," the farmer gets his money without any anxiety whatever.

Perhaps the case of the Muskham Co-operative Society is a good illustration of the benefit which is derived from organisation. The Society was formed in 1899, and the members bought a reaper and binder; the machine paid for itself in two years. Through the agency of this Society feeding stuffs, coals, and other necessaries for agriculture can be obtained.

The Agricultural Organisation Report for last year is not yet published, but the second annual report for the year ending December 31st, 1902, contains a list of the co-operative societies in England and Wales. The total is 76 only, with a membership of about 8,000, made up as follows:—

Agricultural Trading Societies	43
Dairy and Bottled Milk Societies	14
Allotment and Small Holding Societies	2
Poultry and Egg Societies	8
Credit Banks Societies	8
Water Supply Societies	1
	76

There is one organisation of which the latest report has just appeared, and perhaps additional interest is connected with it because of its locality; it is the Coln St. Aldwyns Co-operative Farming Society, Limited. This Society has come through this terrible season smiling, and is able to show on the year a trading profit of £83, which enables the same dividend of 5 per cent. to be paid on the capital of £1,130 as has been paid for the nine years of its existence. The farm is one of 250 acres, and according to the latest report the valuation of the stock-in-trade is £1,490, made up as follows:—£837 in live stock, £155 in implements, £222 in corn, £274 in acts of husbandry. There was in the bank a sum of over £200 in cash and in hand, which with some other small items made up the total assets to £1,720, nearly £590 in excess of the capital, which surplus is treated as a reserve fund. The management expenses of the farm come under the following heads:—Salaries and wages, £257; rent, rates, and taxes, £518. The sales during the year amounted to £928, and the purchases to £145. This is an encouraging example of what can be done by co-operation.

The fact that we in England have larger farms than other countries where co-operation has done so much does not make the case for co-operation here impossible; there is plenty of scope for energy, and many minor details are lost sight of.

How many people have said "What is the use of my going in for poultry or bees? I cannot produce enough myself, and if I did anything how could I find a market," &c., &c.

But it is from small beginnings that our rivals abroad have managed to build up a large and important industry, and now take away from this country thousands of pounds annually.

Small parcels of goods cost more to send by rail in proportion to large ones, and the reason why railway companies can afford to give special rates to foreign produce is partly due to the fact that the traffic is regular and considerable. Could the produce of our country be collected and regularly sent, it would be possible also to get special rates, particularly if packed conveniently for handling and with regard to the space.

I feel sure that any locality in which a desire for organisation in any branch is felt would receive the best attention and advice from the Agricultural Organisation Society, which has already done good work and has a wide field before it.

Ben. Bathurst, M.R.A.C., M.P.

VISIT TO KLONDYKE.

Have you ever done any gold digging? perhaps you are thinking of it, so some random notes of a year I spent in the Yukon may interest some of you.

I had never been in a mining camp, so when my brother came back from the Klondyke and offered to "grub stake" me in there, I was keen enough to go. He had been one of the comparatively few who had ever reached Dawson out of the army of adventurers who had started out to get into the Yukon by the so-called Edmonton route. With his party he had followed the great river system which winter or summer forms the sole artery of traffic to those Northern wilds where the Hudson's Bay factor still lords it over the half-breed and the Indian as they have done for a hundred years. Then branching off from the mighty Mackenzie he had fought his way, wading and tracking his clumsy scow against the icy waters of one of the rivers that come leaping down in a series of rapids from their mountain birthplaces in the Rocky Mountains to swell the waters of the Mackenzie, and finally lose themselves in the great polar sea. Then, overtaken by the winter, he and his party had made sleighs and pulled their goods up the frozen stream, camped on the divide till spring should unlock their passage westwards, started gaily down a river which got steadily worse, saw one of a following party swept to his death by the fierce current, got swamped and practically lost all their outfit except the things they did not want, went through a country so untrodden by man that the moose came out of the woods to gaze at these strange intruders on their immemorial preserves : in fact, he did the whole thing in the original prehistoric way of travelling in these parts. Well, I didn't. I took the Canadian Pacific Railway to Vancouver, went across by the daily steamer to Victoria on Vancouver Island, where I watched some Englishmen playing against a travelling team of American College men for the lawn tennis championship of the Pacific coast. I am sorry to say that I believe the Yanks won. I went to Esquimault, where you see ships of the British Navy apparently engaged in gardening, till you find that they are lying in a narrow land-locked quay with trees coming down to within a few yards of them. Here I got my steamer ticket to Skagnay, the American port at the head of the Lynn canal, on the then disputed boundary country.

It is impossible to describe the trip up the western coast of British Columbia : at one moment you seemed to be steering straight on to one of the beautifully wooded points of the great Vancouver island, and then just when you were bracing yourself for the bump that seemed inevitable the boat would swing round and open up what seemed like a narrow river flowing between rocky banks with the cedars and spruce growing right down to the water's edge. At night, sitting on deck and watching the grey water slipping past and the shadowy shores with every now and then a bright red spot, where some Indian or Chinaman had his little fishing camp, one felt that the prairie with its treeless windswept wastes must belong to another world.

We only touched at Port Simpson, which is the only place on a map that I have ever been to where there was no pretence of a street. There were totem poles with their marvellous carving, clean, deep cut ; with weird tribe totems of man and beast running into each other, so that one could hardly say where the beast began and the man ended. There is quite a large Indian village here, and an old Hudson's Bay fort, with well preserved stockade with the platform running round inside for the men to shoot over the palisade : here, too, is going to be the terminus of the new transcontinental railway. While waiting here for the tide to abate some of its vigour before facing the Corrie Vrechan of that coast we fell in with a most delightful parson, a regular Kingsley man, the champion canoeist of the coast, a great big upstanding fellow with a heart in proportion, so the sailor men told us ; hero of a hundred tales. By one of the curious climatic freaks that Nature is so fond of, snow, we were told, hardly ever lies at Port Simpson (I regret to say that I was told afterwards that it was the only thing that didn't), but as their annual rainfall is something over one hundred inches the climate of the place can hardly be what its real estate men talk about. Here I saw some of the beautiful canoes that the Indians hollow out of a trunk of the yellow cedar (*Nutkaensis* ?) of the coast, most beautiful things, and one could see no sign of a knot, though they were capable of holding up to thirty people so I was told ; they have to be always kept out of the sun, but I don't imagine that worries the owners much when they are staying at Port Simpson. Here we were nearly in sight of the two islands that Lord Alverstone's award has just given to the United States, and so brought a howl of execration on his head from the excitable Canadian press, and threats of awful things that will happen —luckily left vague.

Port Simpson is practically the last British point on the coast, and after leaving it you go through a series of beautiful islands, between which and the mainland the tide rushes at some prodigious speed ; on the mainland you can see rising out of the sombre green of the forest-clad slopes great, blue green glaciers. It gets much colder, too, and one generally runs into fog from the cold air on the warmer water or the warm air on the colder water, according to the season ; and this makes the navigation of this coast, with its infinite number of turnings, so dangerous. Soon after leaving Port Simpson we were boarded and taken in charge by the great American nation in the person of a friendly gentleman in a low cut waistcoat and evening tie—and other things—who smoked innumerable cigars, grown in the neighbourhood one would imagine by the smell, and under his escort we were permitted to enter the territorial waters of the United States. Skagnay lies in the trough of a magnificent valley which continues into the sea, so to speak, as the Lynn Canal, a "canal" on this coast being simply a fiord. The town itself is overhung by the most magnificent peak I have ever seen, and to look up from its squalid streets and dirty board side walk and see this glorious tooth of rock towering thousands of feet above you is —well, go and see it. The Americans are not good at names where they have no Indian name to translate, and this king of rocks is probably called Mount General Jackson. I don't know, but knew enough not to ask. I had made the acquaintance on the boat of a Western American telegraph man who was spying out the land in the interest of some firm of wireless telegraphy, Tesla's I think, and his disgust on landing on American soil to find it garrisoned by a black regiment was very funny. I have too much regard for the *Gazette* to record what he said, but it gave one a good idea of the tremendous problem the colour question must be to the responsible leaders in the States.

Skagnay had been what is known as a "tough place": that is to say it was run for the benefit of a gang of gamblers and "bad men," headed by a small decided person of the name of Smith, who, having run the town to his own extreme benefit for some time, was ultimately shot on the street by one of the citizens. When I was there it was mainly remarkable for the astounding clothes worn by the population. This was evidently the real thing, Bret Harte run wild: long hair, long boots, long oaths, and long—very long—drinks; but when one looked into it a little more closely you found that this was as far as most of them went. They had too much respect for their wonderful get-up to endanger it at the diggings.

From Skagnay you take the most wonderful train in the world, I should think, up the White Pass; such a pass, with great slabs of limestone hanging over a roaring, tearing river, and your little narrow-gauge toy train is scraping the edge of the bank all the time; and I haven't got over the gasp I gave when I saw one of the train hands step off the car on to what was left over of the track—it seemed that he *must* step over into infinity. However, he didn't, and my gasp was thrown away. When you get over the pass you come out on to a high moor just like a lot of the high points in Scotland, only rather barer and balder; and after a little we came on the welcome sight of the old Red Cross floating side by side with the Stars and Stripes, showing that we had reached the time fixed by the *modus vivendi* and since ratified this fall in London. Soon we were at the end of our railway, at the little station village at the head of Lake Bennett, where the scows were built to carry the gold-seekers down the Yukon. It was pretty busy when I got there, at its original trade, and scows were on all sides and in all states being rushed ahead to get into Dawson before the river froze up. Here you took another steamer, this time a stern wheeler, light draught boat, which took one down as far as the famous White Horse rapids, which with another close succeeding rapid was one of the black spots for the original scows, though they have now got the science of river running down so fine that they hardly ever lose a boat. Some ingenious fellow, to his own infinite profit, had made a tramway past these dangers, a rough sort of flat car running on great rounded wheels, the rails made of poplar poles dovetailed into one another. This took the freight at some exorbitant sum per lb. and the mob—*quorum ego*—walked. I believe some aristocrats and friends of the family, so to speak, rode with the luggage. All along the portage you found blazed trees with messages to following friends, or below the rapids triumphant notes, to prove for as long as the pencil marks would last that James G. Brown and his party from Chicago, Illinois, had safely passed the famous rapid at such and such a date. I mustn't stay to tell about the getting down the lower river in another stern wheeler, or how we stuck on a bar and got off after infinite work by the aid of a pair of artificial legs fastened to the bows of the boat, and on to first one and then the other of which we were hauled up by a donkey engine and capstan ; or how we tied up to a great fir tree by the river and pulled and tugged till we triumphantly got off a sister boat, or how we went tooting our whistle in derision past an unfortunate boat of an opposition line stuck fast on a sandbar, and "liable to stay there till she froze up," as our unfeeling pilot remarked. The river was falling fast, winter coming on, and time was very precious, and we ourselves struck on bars often enough to make us very glad when we finally swung round a big bend and saw the hill towering over Dawson, with the scar on its face whence came the big rock slide that overwhelmed a camp of Indians in days gone by. With a great tooting of our whistle we slowly worked our way to our tieing-up place, and there we were at Dawson, the centre of the land of gold ; and these lounging crowds were the men who were digging fortunes out of the gravel of the neighbouring creeks. This was the town where the boys used to pan out the sweepings of the bar rooms, and after a "good night" would clean up 30 and 40 dollars worth of gold dust. A main street facing the Yukon, with two storied stores and biggish buildings of various sorts, mostly log, but even then beginning to change into fronts of dressed lumber, backed by an innumerable collection of little one-roomed log shanties scattered all over the face of the steep hillside like stones on a north country intake. But to me the great feature was the crowd of men on the street, passing and re-passing, apparently having nothing to do ; men like ourselves on the prairies, only more mackinaw and less cotton overall, obvious Englishmen ; their bright clean beef and beer faces shining out amongst the sallow high-cheeked lantern-jawed Westerners, or the curly headed big boned Swede : and then if you turned to the names on the shop fronts you would read the names of the lords of the Northern Pacific slope—the German Jew—with his Goldsteins and Rosenthals and the rest of the sheeny clans.

Here I found my friend, and soon we were swapping the news of mutual doings and friends ; and here I think the Editor will cut me off if he has suffered me thus far.

GERALD SPRING RICE.

THE NEW MOVEMENT IN IRELAND.
PART II.—STATE-AID.

In a former article* contributed to this *Gazette* the writer attempted to describe in its earlier phases the recent movement for the social regeneration and the material development of Ireland from the point of view of Agriculture and other rural industries. Readers of that article will recollect that the outcome of that movement was the formation of the Irish Organisation Society and that its subsequent history was practically an account of the many-sided activities of that far reaching and ever widening organisation. One of the chief characteristics of the organisation there described was its purely voluntary character; it sought to develop among the farmers of Ireland a spirit of self-reliance and co-operative enterprise, and it depended largely upon the voluntary efforts of a few public-spirited individuals for its central organisation and general policy. Wonderful as the success of the Organisation was, it found itself hampered in many directions by the magnitude of the task before it, for it was very frequently compelled to undertake duties more properly performed by a state department.

---

* "The New Movement in Ireland. Self-Help."—*Agricultural Students' Gazette*, Vol. XI., p. 51, December, 1902.

A general lack of technical education, scarcity of trained men and women to fill responsible posts in the newly-established co-operative societies, prevailing ignorance as to improved methods of dairying and cultivation and as to the most profitable manures to apply and the most suitable varieties of seed to use were some of the obstacles to progress which had to be overcome, and the I.A.O.S. proceeded to the best of its ability and to the extent of its resources to overcome them. In any country there must be a limit to the powers of a voluntary organisation, in a comparatively poor and backward country the limit is sooner reached.

In 1899 steps were taken by the Government to remedy these deficiencies; by the Agriculture and Technical Instruction (Ireland) Act a Department was established with extensive powers and functions which it is the object of the present article to describe. The purpose of the Act was to establish an Irish Department of State so constituted as to be representative at once of the Crown, the recently established Local Government bodies, and those classes of persons with whom its work is chiefly concerned. With this object there have been appointed to advise and co-operate with the Department an Agricultural Board and a Board of Technical Instruction, partly elected by the Council of Agriculture, a body representative of all the County Councils, and partly nominated by the Department.

The portion of the Department's Endowment Fund intended for purposes of Agriculture, which amounts to £100,000 per annum, must be administered with the concurrence of the Agricultural Board, which meets at intervals of two months for the purpose of conferring with and advising the Department. A representative element is thus introduced into the councils of the State Department which cannot fail greatly to increase its adaptability to the needs of the community and consequently its efficiency.

The powers and functions confided to the Department are far too varied and extensive to be dealt with in a single article, involving as they do a commission to attempt not only to develop the industrial resources of the country, but to influence in vital ways the education of the people. All that will be attempted is to describe briefly the more salient features of the work of the Department as it directly affects Agriculture and rural industries.

The methods by which the Department seeks to attain the realisation of the objects for which it was established fall roughly into two divisions, direct and indirect methods of action. The former category includes such schemes as those which have for their object the improvement of the breeds of live stock, itinerant instruction of the farmers themselves with direct reference to the cultivation of their holdings, itinerant instruction with reference to other rural industries, an improvement in the methods and means of the transit of agricultural and other industrial produce and in the condition in which it is placed on the market, assistance in the form of loans to societies such as agricultural credit banks, and to creameries for the improvement of their plant, special investigations with a view to throwing light on subjects of importance to the agricultural community.

Indirect methods may be summed up in the word education, in the strictest sense of the term, comprising a complete and co-ordinated system of elementary scientific education, leading by successive steps to technical and higher scientific training.

The general policy pursued by the Department is that of acting as much as possible in co-operation with the Local Authorities. The Department is, in fact, expressly prohibited by the Act from applying or approving of the application of money to schemes in respect of which aid is not given from local sources; but, apart from this statutory obligation, a study of the methods of the Department shows that it has grasped the true principles and limitations of State action. Such action on the part of the State is most effective when, while seeking to evoke and stimulate self-reliance and enterprise on the part of local bodies, societies, and individuals, it employs its resources and its authority in co-ordinating that enterprise and supplying it with expert assistance and central direction. That is the ideal which the Department has kept in view.

In order to more thoroughly understand the agricultural branch of the work it is necessary to examine it in detail. For this purpose it may be conveniently divided into the following heads.

AGRICULTURAL INSTRUCTION.

In developing its scheme of technical instruction in agriculture and other rural industries, the aim of the Department has been to formulate a complete and co-ordinated system, in which, commencing with the primary school, each grade prepares the way and furnishes pupils for the succeeding grades, so that there is, as it were, a continuous educational ladder by which a pupil with ability and perseverance may ascend from the primary school to institutions devoted to the highest form of pure and applied science and to the work of original research. At the bottom of the scale the primary school prepares its pupils by some form of nature study and object lessons giving elementary notions of natural phenomena for the succeeding course in the upper primary and secondary school, in which the programme of the Department provides for a four years' course in experimental science, drawing, and manual instruction, the instruction during the first two years being made to subserve the interests of general education, that of the second two years being specialised with a view to some particular industry.

Special provision is made for pupils who have not been prepared for, or who cannot devote the time necessary for the whole course by giving them an education complete, as far as it goes, and directly framed with a view to preparing them for the business of life.

For distinctly technical work on the agricultural side, such as, for instance, the preparation of men and women for the career of creamery managers, provision is made at the Albert Institute, Glasnevin, for men, and at the Munster Institute, for women; while at the Royal College of Science the highest form of agricultural education is given to prepare those intending to become lecturers and investigators, and scholarships are awarded for this purpose.

The scheme here described is an ideal which it is impossible to realise at once, and which requires and will always require supplementing in more than one direction. The present generation of farmers and sons of farmers have not enjoyed the necessary preparation, and have not the time to devote to study to enable them to reap the full benefits of the scheme, and in the future there will always be many similarly situated; at the same time they stand in need of instruction and advice, and are entitled to it in matters relating to their calling. Such men are not concerned so much with the scientific process of reasoning as with the net practical result arrived at as it applies to their own case. For this purpose the Department attaches great importance to itinerant instruction, and contemplates providing in each county one or more instructors in agriculture, poultry keeping, bee-keeping, dairying, and kindred subjects. In 1902 ten counties had appointed instructors in agriculture. In the majority of cases the Department pays the whole salary of the agricultural instructors, the County Committee defraying the expenses of locomotion.

During the third year of the Department's existence 719 lectures were delivered with an average attendance of 90.

To those familiar with the history of agricultural education in this country it is evident that the experience it affords has not been lost on the Irish Department. With us the mistake has been made of founding institutions for the study of the higher branches of the subject, furnished with every means of instruction, but lacking an adequate supply of pupils prepared to receive it. It is to a comprehensive system of scientific instruction in the secondary schools that we must look to provide agricultural pupils for the collegiate centres. In Ireland the endeavour has been to lay the foundations as broadly and deeply as possible, and to leave the completion of the superstructure till they are secure. In time other institutions, such as the Royal College of Science and The Albert Institute, will be required. At present they are sufficient to meet the needs of the country.

AGRICULTURAL EXPERIMENTS AND SPECIAL INVESTIGATIONS.

The Department has recognised the educational value of agricultural experiments and has carried out a number of experiments chiefly confined to the manuring of the ordinary farm crops and the comparative trials of a few new and old varieties of seeds, and when possible has placed them under the supervision of the most competent men available—the County Instructors. In order to supply the deficiency when no instructor existed the Department determined to enable farmers to carry out simple demonstrations for themselves, and with this object undertook to provide applicants with sample lots of seeds and manures at cost price. No less than 285 tons of seeds and manures were sent out in 7,241 packages, and were distributed to 3,459 farmers, many of whom supplied reports as to the results of the experiments. This work has largely been carried out through the medium of the local co-operative societies. Special experiments were carried out with the co-operation and assistance of Messrs. Guinness and Co. on the growth of barley; also on early potato growing, as to the best disease resisting varieties of potatoes; and on fruit growing and preserving; as to the suitability of Irish land for the profitable production of cheese; and as to the best substitutes for cream in the feeding of calves.

SPECIAL INVESTIGATIONS.

In addition to experiments, the Department has conducted a special investigation as to the cause of the very serious mortality amongst calves from white scour and lung disease, which had been devastating certain districts. The services of a distinguished French bacteriologist were secured, a laboratory in Limerick was provided, and after a short period of investigation it was proved that the disease was due to a bacillus which enters the system through the navel, and that the presence of the bacillus was favoured by insanitary conditions. Based on these discoveries, means of prevention by dressing the navel and by greater attention to the cleanliness of cow byres were suggested and disseminated by the Department.

IMPROVEMENT OF LIVE STOCK.

In formulating their live stock schemes the Department's main object was to promote improvement in the breeds of the country by encouraging private enterprise in the breeding of pure-bred animals and in the introduction of new sires, and to do this in such a way that the accompanying advantages should be principally secured for the smaller farmers. In order to adapt the scheme as far as possible to the needs of the locality, the Department consulted the county committees and the special advisory committees of experts appointed for the purpose by the Department. The essential features of the horse-breeding scheme are:—

(*a*) The registration of Thoroughbred, Shire or Clydesdale stallions (these are the only breeds sanctioned) calculated to improve the breed of horses, all of which must be entered in their respective stud books, and must have passed an inspection as to their suitability and a veterinary examination as to their freedom from hereditary disease or malformation. No stallion unless on the register will be available for free nominations to mares. In the second year of the scheme 111 thoroughbred and 51 agricultural stallions were registered.

(*b*) Nominations to selected mares. The owner of a registered stallion will be entitled under the scheme to a fee of £3 in some cases, of £2 10s., and £2 for each selected mare put to his horse. Suitable mares are selected by competent judges at exhibitions specially held for the purpose, and free nominations to a registered stallion are awarded to the owners. The owner of the mare may select any horse on the register, though in some cases the breed is specified. In 1903 2,785 nominations were awarded. A certain sum is also expended in the form of premiums and loans to approved purchasers of horses intended for registration. With a view to arresting the exportation of young mares, the scheme provides for the application of up to 30 % of the sum set aside for this purpose in the form of prizes to young mares in foal to or with a foal at foot by a registered stallion. For the purpose of improving the breed of cattle a sum of £9,390 was expended in 1903 in the form of premiums of £15 for yearling and two-year-old bulls on condition that the animal is available for service of cows the property of a *bona fide* farmer, the valuation of whose holding is below a certain limit, at a fixed charge of one shilling. Premiums are awarded at recognised shows and sales by competent judges. None but pure-bred animals are eligible for premiums, the breed being determined by the county committee. Farmers are also encouraged to retain their best heifers for breeding purposes by the award of prizes. The scheme for the improvement of swine is framed on the same lines as that for cattle. That for sheep consists in distributing prizes at local shows, since from the nature of the case the joint use of one ram by different flocks is impossible. The total sum expended during the year ending March, 1903, on the live stock schemes, apart from loans and premiums to stallions, amounted to £14,531. This is very much below the sum earmarked for the purpose, and the expenditure under this head will certainly increase. In addition to this a considerable contribution is made by county committees for the same purpose.

MISCELLANEOUS.

Inspection of Creameries.—Previous to the establishment of the Department, two instructors had been appointed by the Board of National Education, and one by the Irish Organisation Society, for the purpose of visiting creameries and supplying expert advice regarding the erection of or structural alterations to buildings and general information on the most modern methods of butter making. The work of these three experts has been continued and paid for by the Department.

Loans to Creameries for the Purchase of Pasteurising Plant.—Under the creamery system, by which the milk of several owners is collected and mixed, the danger of the spread of infection from one source and of the contamination of the whole output of butter and of separated milk is always possible, and to guard against this it is highly desirable that every creamery should be provided with a Pasteurising plant. To encourage creameries owned by societies of farmers to erect such plant, a sum of £5,000 was set aside to be lent at 3 per cent., on the security of the collective bond of the members of the society.

By such action as that mentioned under the last two headings, as well as by assisting in the organisation of agricultural banks which formed an important feature in the scheme of the Irish Organisation Society, the Department has shown itself ready to assist and carry on the work of that valuable organisation.

Seed Testing Station.—With a view to protecting farmers against the purchase of inferior seed the Department has made arrangements whereby samples of seed may be tested with reference to purity, germination, true value, germinating energy, and pedigree, at nominal charges. Sample guarantee order forms are also circulated to farmers.

Flax-growing Industry.—To meet the decline in this industry the Department arranged a conference of the principal flax growers and spinners, appointed an advisory committee, appointed experts to make enquiries into continental methods of "scutching," and to disseminate information as to the best methods, and also assisted the Flax Supply Association and Combination of Flax Growers in the payment of other experts, and carried out experiments as to the best varieties of foreign seed, the effect of manures upon the growth and quality of flax, and foreign methods of preparation. The inquiries and experiments showed that the usual Irish method of preparation is less perfect than the continental method, and that much of the seed used is inferior.

Such is a brief summary of the aims and methods of the Irish Department of Agriculture and Technical Instruction in the first three years of its existence. What strikes us most forcibly is the very much more prominent part played by the State in the agricultural and industrial life of the people of Ireland than in this country. This arises largely from the necessities of the case. In the first place, Ireland is a comparatively poor and backward country; the occupiers of the land are, for the most part, men of small capital and meagre education; further, Ireland has never had a full share of the personal interest and guidance of her larger land-owners, who in matters agricultural are the natural leaders of the community. A peasant proprietorship is naturally not progressive: it is too much occupied with the pressing needs of daily existence to have much power of extending its horizon. In England it is otherwise. In no other country have the rich taken so much interest in agricultural matters. In no country has so much private wealth and enterprise been devoted to the improvement of live stock and the land.

That the relative importance of the parts played by the individual and the State in the development of the agricultural industry in this country is the true one is open to question. So far individual enterprise has enabled us to keep the lead of most other countries, but we are beginning to learn that in these days, when organisation, information, and science play a larger part in industrial warfare than was formerly the case, the co-ordinating influence of a State Department may be a material factor in success.

BRUCE SWANWICK, M.R.A.C.

The writer is indebted to the Annual Reports of the Department for the information contained in this article.

POULTRY FARMING.

In consequence of a letter from the Editor of *Gazette* asking me to write a few words on the Profits of Poultry Farming, I have been much exercised in my mind as to what I could say in this matter, and in my perplexity asked a friend of mine his advice. This he very promptly gave me, " Better write about the losses." Well, he hit the nail on the head, for I personally cannot tell you of a single instance of a farm, run for the purpose of poultry keeping alone, which is a commercial success.

That there are a few concerns earning a precarious income by selling birds at fancy prices to the guileless amateur commencing, and adding thereto the fees taken for pupils, of which there always seems to be a supply, I do not deny, but they are few in number. I could give, I regret to say, the names of many who, led away by the glowing accounts of the profits to be made, so regularly to be seen published in the poultry papers, have been induced to take a place in the country with a few acres of land, invest a lot of money in putting up runs, purchase of poultry houses, incubators, &c., and an expensive stock of pure-bred birds, only to lose it all in a very few years.

I do not include chicken fattening in the term poultry farming, as this is a distinct business, the fattener as a rule keeping no stock birds of his own and requiring no land, as from the day he receives the birds till they go out fat they are confined to the coops, so that there is no risk from foul ground to be encountered. He makes a special study of the markets and their requirements, and knowing where to place his birds to the best advantage can afford to pay the rearer a remunerative price for his birds. He would welcome a very large increase in the production of the best table birds by farmers, whose stock having free range are usually healthy and suitable for putting on weight and fat, which is seldom found to be the case in those reared upon poultry farms, or by exhibitors ; as even when apparently healthy they have not the constitution to stand the necessarily rich and forcing diet to which they are subjected, to turn them out fat, in the three weeks of their confinement.

The fowls on an English farm, being usually the perquisite of the wife or daughter are too often looked upon as a nuisance to be tolerated, instead of a good paying side line as it should be. The supply of the best English table birds is consequently lamentably small, and were it not for Ireland fully one-half of the fattening establishments would be compelled to cease operations for want of the raw material.

Now as to the bird a fattener requires to enable him to produce the article which will make the top price in London market, which at present takes by far the largest supply (although the provinces are purchasing more and more year by year, the eating qualities—flavour, texture, and tenderness—of the bird being so marvellously improved by the fattening process that they only require to be known to find a ready sale). It must be a bird which will attain to a large size before becoming what is known in the trade as "hard," *i.e.*, bone instead of gristle at end of breast, signs of spurs in the cockerels, and widening and inflexibility of the vent bones in the pullets; should have short white legs, long keel, plenty of bone but not too coarse, good glossy plumage but no exaggeration of feather as seen in exhibition specimens.

So far as my experience as a fatter for some seven seasons has enabled me to judge, and considering the breeds and crosses from a fattener's point of view alone, the best are to be found in appended list A, those producing only second quality birds in list B, list C being those which are of no use to the fattener at all :—

PURE BREEDS.

A.	B.	C.
Surrey and Sussex Fowls Dorkings Buff Orpingtons White Orpingtons	Faverolles Rocks Black Orpingtons Wyandottes Houdans Game Langshans	Leghorns Minorcas Andalusians Spanish Campines

CROSSES.

A.	B.	C.
Dorking — Buff Orpington Dorking—White Orpington Dorking—Rock Indian Game — Orpington Indian Game — Dorking	Old English Game and Dorking Indian Game and Faverolle Dorking — Houdan	All Crosses of Leghorns, Minorcas, &c.

In conclusion, if there are any at the R.A.C. stricken with the hen fever, I would advise them to study fowls to the utmost of their ability as a useful and paying item in the live stock of a farm, but not with an idea of making a living out of them entirely by crowding a large stock on small premises, which is foredoomed to failure. If there are any would be fatteners let them consider that the hours are long, profits small, and the occupation monotonous to the many, interesting to the few.

FRED. H. WEBER.

Rokeby, Toker's Green, Caversham.

ADVICE TO PUPILS.

I have been asked to write an article in the *Students' Gazette* and am therefore about to endeavour to fulfil my promise to the Editor, though I candidly confess that since making the promise I have had many misgivings, being, as I am, a humble agriculturist who does not aspire to any literary merit. Having made my apology, I trust the following few hints will be read in the spirit in which they are given, namely, as a possible means of assisting those of the Students at Cirencester whose intention it is to qualify themselves for that most anxious, yet most delightful profession, Land Agency of Agricultural Estates. The first step after the College career is one on which it may be hard to come to a decision, and especially to those with the honours of a brilliant College career still thick upon them, and who are thereby probably under the fond impression that they are fully qualified to undertake the management of any landed estate. What I mean by this is that the College career should be looked on as merely a ground-work for the budding Land Agent, and here let me add that the Cirencester course is absolutely the best grounding that any young man can possibly get for his future as a Land Agent. I make this special point as to the College career being only a ground-work because experience has taught me that the first and foremost qualification for a successful Agent is the ability to both judge and deal with men. He has to meet and have business relations with all classes, and let it be remembered that it is not always the cleverest man who makes the best Agent, but rather the man blessed with an abundant supply of common sense and one who does not endeavour to "best" everyone with whom he comes in contact.

Now comes the question—where can the embryo Agent hope to qualify himself in the possession of these valuable attributes? Undoubtedly as a Pupil on a large Agricultural Estate on which, if possible, a Home Farm is kept and good stock of all kinds bred, and if there is a certain amount of house property, river, quarries, and railways on it, so much the better. In selecting an Agent to go to as a Pupil, I would never advise an agreement being entered into whereby the Pupil agreed to stay for any period over twelve months; customs of country are so varied that it is far better for a Pupil to spend, say, four years with four different Agents than to remain the whole period with the same man, however attractive and instructive the place may be, as a Pupil never knows in what part of the country he may obtain a post, and therefore his aim should be to acquire the maximum amount of varied experience in a minimum space of time.

Having made satisfactory arrangements with a suitable Agent, let the Pupil remember that he is entering on a profession the duties of which—paradoxical though it may sound—cannot be taught but can be learnt. He will probably have access to all documents and books in the office and all questions will, I have no doubt, be readily answered, and the Pupil should never be afraid of asking questions on all and sundry topics ; he cannot expect the Agent to act as a schoolmaster, but he has a right to expect that the benefit of the Agent's experience be given him, and the general routine of the work of the office is at his disposal if he chooses to look into and follow it. Let the Pupil make friends with all heads of departments, Clerk of Works, Forester, Bailiff, etc., and endeavour to obtain from them the fullest possible details of their several departments. In the office there will probably be a Confidential Clerk whom the Pupil will find a most useful and valuable help to him in his quest of knowledge, and I would advise him to adopt some definite course of work whereby he devotes himself in the office to mastering the details connected with such matters as Leases, Agreements, Titles, Rates, Taxes, Water Rights and Water Wrongs, Rights of Way, Farm Valuations, etc., and take each in turn and give as many days to each subject as will give him a thorough insight into its intricacies.

On the Home Farm let the Bailiff be the store of knowledge rather than any of the men of the Farm ; I do not say they cannot give much valuable information, but it is a good policy to make it a rule never to interfere with them in their work by occupying their time in answering questions. Let the Pupil utilize every opportunity of studying the habits and peculiarities of every kind of stock, and if Pedigree Herd Books are kept let him make a copy of each and keep it up himself. A judge of stock is born not made, but it is perfectly possible for anyone of an observant nature who has a love for animals to acquire a very sound knowledge of stock.

As to other branches of farming the Pupil will have endless opportunities of putting all his pet theories into practice and noting results. I now come to the important question of the Pupil's dealings with Tenants on the Estate ; a great deal of tact is needed, and on no account let the Pupil ever be the means of carrying complaints from the Tenants to the Agent. I am privileged to number amongst my friends and acquaintances many Tenant Farmers in different parts of England for whom I have the very highest regard, but I know it is a temptation to Tenants to endeavour sometimes to enlist the Pupil's sympathy if they have a grievance and thus hope to have it remedied. With this single warning I would suggest that the Pupil make friends with every Tenant he can and pick the brains of each, and I am sure he will never regret it. A short Diary written up each evening will be found extremely useful and in after years a most pleasant book of reference.

Now as to amusements, these must never stand in the way of work, but to the Pupil who can afford to do so I would advise at least one day's foxhunting a week; he will learn much that is useful to him in after-life, and will enjoy much hospitality if he can indulge in this the finest of all sports.

In conclusion, may I ask the Pupil to bear in mind that he is entering a profession which is a many-sided one, and one in which he will probably find he has great power for good or evil, and is therefore taking on himself no light responsibility; but to one who does not shrink from bearing responsibility, and is determined to deal fairly with the parties whom he is called on to represent, there is no reason why his life should not be both a useful and at the same time a very pleasant one.

A. G. Weigall, M.R.A.C.

VACCINATION AGAINST BLACK-QUARTER.

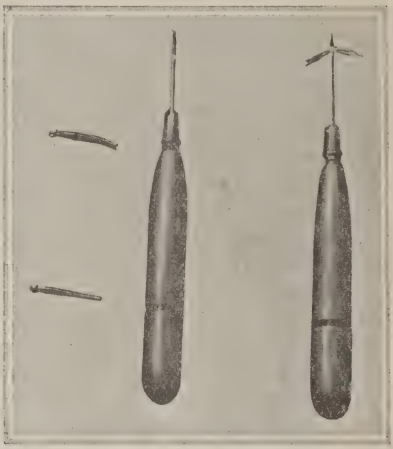
Black-quarter, a highly infectious disease peculiar to cattle and sheep, is known to the agriculturist under the various names of black-leg, quarter-evil, the strike, or irons. Of these names black-quarter is the more correct, as indicating the appearance of the diseased condition in the quarter of an animal when attacked, as well as the colour of these tissues upon a post-mortem examination. Of the diseases common to young stock, black-quarter is responsible for a great number of serious losses in many districts; and for years many attempts have been made to prevent it, or to lessen the percentage of deaths.

The reason that these attempts have not met with success is that they mainly depend upon various depletive measures, some of a local character, for example, the insertion of setons or pegging in the dewlap, and others the administering of medicines internally, which have no lasting effect upon the animals.

As the disease is the result of the taking into the system of a special germ or spore, principally through the digestive tract, and so into the circulatory system, any satisfactory results on the line of prevention must be looked for in the introduction into the animal's body of an attenuated or modified virus obtained from the specific germ itself or its products, which will have the power of rendering the system proof against the disease from which the virus has been obtained.

The age at which black-quarter is met with varies considerably from that of five weeks up to eighteen months, and generally seen in the spring and autumn, but in certain districts age and time of year vary so much that local conditions and susceptibility must determine at what period vaccination should be carried out.

The researches of Pasteur, Arloing, Cornevin, and Thomas have been rewarded in placing within our reach vaccines prepared from the germ products to meet all conditions, and put up in such a form that the operation for the introduction of the vaccinal material into the body becomes a very simple matter, and as results have also proved very effective; but it must be borne in mind that the younger a calf when vaccinated the shorter the period of immunity from the vaccination, so that it is advisable to vaccinate young animals a second time after a lapse of six months.



The Pasteur Vaccine Company prepare two kinds of vaccine, called the first or single vaccine, and second or double vaccine, made in a cord form of several small strands of cotton material impregnated with the vaccine, joined together with a brass tab (as will be seen by the photograph). The single cord is preferable in young stock, the double cord necessitating two vaccinations at an interval of eight days for older and pedigree stock.

The operation is carried out as follows :—After haltering the calves clip a small portion of hair off the skin midway between the top of withers and shoulder joint on the left side, wash the clipped surface with some antiseptic solution, hold a portion of the loose skin between finger and thumb, make a small nick through the fold of skin with the point of the scissors (I find this greatly facilitates the insertion of the needle under the skin). There are two needles provided with the outfit : sterilize one in boiling water and rinse in an antiseptic solution before screwing into handle, then take out one of the cords from the packet holding it with the brass tab, thread the eye of the needle with the cord and cut off the brass tab before insertion, as shown in illustration.

After lifting up the fold of skin where the incision has been made, pass the needle armed with the cord slowly underneath the skin until it is hidden, keeping the needle handle close down to the skin of the shoulder blade to prevent the needle point from passing into the muscular tissue, give the handle one turn round, holding the portion of the needle with the cord firmly between the fingers and thumb, to disconnect the cord from the eye of the needle, pull needle gently out; the operation is then finished. No after treatment of the wound is necessary if thorough cleanliness is ensured. When the second form is used repeat the operation on the right shoulder in exactly the same way about eight days after the first; it is advisable to keep the animals up for a week before turning out to pasture.

The vaccination in sheep is carried out in precisely the same way, selecting the thin skin on the inside of the thigh instead of the shoulder in calves.

W. T. Wilson, F.R.C.V.S.

COLLEGE NOTES.

Botanical Garden.—Thanks are due to the Director of The Royal Gardens, Kew, and to Messrs. Sutton and Sons, of Reading, for presenting seeds to the College for use in the garden.

Forestry Museum.—The Director of Kew Gardens has presented a number of specimens of foreign timbers; and the Deputy Ranger of Windsor Park has also sent through the Deputy Surveyor several logs of timber grown in the Park. It is hoped that those interested in the College will assist in the formation of the Forestry Museum by giving specimens illustrative of sylviculture, forest diseases, and forest pests.

OBITUARY.

We regret to note that Mr. William Rowntree Robertson, M.R.A.C., who took his Diploma in July, 1863, died on January 23rd at his home at Bourn Lodge, Bourn, Cambridge. Mr. Robertson joined the Madras Civil Service in 1868 as Superintendent of the Government Farm, Saidapet, and he served in India for twenty years. In 1876 he became Superintendent of the Government School of Agriculture at Saidapet; in 1882 he was elected Fellow of the University of Madras and Agricultural Reporter to the Government of Madras. In 1884 he was appointed Principal of the College of Agriculture at Saidapet, and in 1890 retired from the Government service. During his connection with Saidapet he did much good for Indian agriculture and agricultural education. During his retirement at Bourn he was a J.P. for the county of Cambridge.

ATHLETIC SPORTS.

President.—Rev. J. B. McClellan.

Stewards.—Prof. Kinch, Prof. Paton, Prof. Blundell, Prof. McClellan, B. S. Cave, Esq., C.B., G. G. Symons, Hon. J. E. Henniker, C. A. Cooke, H. Middleton, W. D. Stevens, H. S. Matthews.

Hon. Secs.—A. P. Slingsby, J. E. Geoghegan.

Judges.—Prof. West, Prof. Woodley, E. B. Haygarth, Esq.

Starter.—J. A. Ross-Hume, Esq. *Time Keeper.*—Prof. Locke.

When comparing the sports which were held this year on March 23rd and 24th with those of some preceding years, we find that they have been of about average excellence, certainly not so successful as in some years; and when we analyse the causes which led to mediocrity we are forced to the conclusion that they are to be found, first, in the fact that although the number of entries was unusually large the number of starters was disproportionately small, rendering the heats in some races, particularly the 100 Yards and 200 Yards, uninteresting; and, secondly, in the fact that the cold weather experienced had the effect of reducing the enthusiasm of the spectators very nearly to the vanishing point. The coldness of the weather was doubtless responsible for the number of visitors on the second day being below the average;

those who braved the severity of the March wind had as a reward the spectacle of some very interesting races, and were entertained in addition by the band of the 4th Battalion Gloucestershire Regiment.

The Sports Committee was composed of Messrs. Kinch, Symons, Henniker, Cooke, Mathews, Slingsby, and Geoghegan, the last two gentlemen acting as secretaries, and to the energy of Mr. Geoghegan the success of the sports was largely due.

The most interesting feature of the Sports was the exceptionally fine running of Henniker, who won both the Mile and the Three Miles, the latter in the good time for the College track of 16 minutes 34 seconds, thus reducing the College record for the distance by 21 seconds, and annexing the very handsome cup kindly presented by B. S. Cave, Esq., C.B., for this event. The previous holder of the record was A. B. Hopkins, 16 minutes 55 seconds, in the year 1883.

The final of the Hurdles produced another most interesting race, in which only a yard separated the four competitors at the finish, McDiarmid actually winning, and thus annexing the Jumps Cup.

The Long Jump resulted in a very close competition between Poore and Knubley, the latter, whose style was good, having to acknowledge defeat by 2¾ inches. Four other competitors took part in the event.

The Half-Mile (open) brought out a field of 10, Watson winning easily. This race seems to have been beyond his distance; as a result of the effort it involved he failed to do himself justice on the second day in the shorter races, in which he showed last year that he had a considerable turn of speed.

On Thursday, the Quarter-Mile was the first event on the card, and this race was robbed of all interest by Watson being unfit, Murray winning very easily, and later in the day the same competitor won the 100 Yards after a good race with Cooke and Watson.

The Two Mile Walking Race, for which Mr. and Mrs. Swanwick gave a cup, attracted the largest field of the meeting, no less than 15 competitors starting, in varieties of style and costume. In this race the indefatigable secretary fairly romped home quite 30 yards in front of Iredale, the latter being followed by Mankowski a similar distance away.

In the afternoon the only events, not already mentioned, of a serious nature were the High Jump, which was well won by Cooke, who cleared 5 feet; the 200 Yards and Half-Mile Handicaps, both of which were won by Mott, who was very leniently dealt with, being given the limit allowance in each race; the Consolation Race, won by Dobson; and the Tug-of-War, in which the In-Students had a wholly unexpected and hollow victory over the Out-Students.

As regards the amusing items, the Sack Race resulted in a win for Knubley, Blaker being second; whilst in the Bicycle Egg and Spoon Race, Anderton and Lees were the winners; and in the Three-legged Race Deane and Lees out-distanced Slingsby and Fellowes.

As usual much the most amusing event was the Donkey Race, the costumes being good and original. The starters were Mr. Lees, as a

"Cow Puncher," on Colorado Bill; Mr. Blaker, as a "Butcher," on Cumberland; Mr. Lambert, as a "Boer," on Kruger; Mr. Abecasis, as "Sunny Jim," on Force; Mr. Slingsby, as "Baby," on Newcomer; Mr. Anderton, as a "Donkey," on Twin; Mr. Lawson, as a "Jovial Huntsman," on Blue Ribbon; and Mr. Henniker, as a "Lunatic at Large"; and Mr. Jung, as a "Native of India." The race was won by Jung, Slingsby being second; whilst the latter, as "The Baby," carried off the costume prize. The usual Donkey Card made its appearance, and bore a strong resemblance to that of two years ago.

The medal was won by the Hon. J. E. de G. Henniker, with 41 points; and the prizes were very kindly distributed by Mrs. Swanwick, to whom Mr. Geoghegan proposed a vote of thanks, carried by acclamation; and, on the conclusion of the applause, Mr. Bruce Swanwick suitably replied on his mother's behalf.

The following is a list of the winners of the different events:—

100 YARDS.—*Semi-finals*: H. T. Watson, 1; M. P. Knubley, 2. Time, 12 2-5th secs. P. J. Murray, 1; C. A. Cooke, 2. Time, 11 4-5th secs. *Final*: P. J. Murray, 1; C. A. Cooke, 2; H. T. Watson, 3. Time, 11 3-5th secs.

LONG JUMP.—J. Poore, 1, 18 ft. 1 in.; M. P. Knubley, 2, 17 ft. 10¼ in.

200 YARDS HANDICAP.—*First Heat*: J. E. Geoghegan (12 yds.), 1; G. M. Dobson (12 yds.), 2; B. J. Pero (15 yds.), 3. Time, 22 1-5th secs. *Second Heat*: M. P. Knubley (2 yds.), 1; L. B. Akers (16 yds.), 2; H. T. Watson (scratch), 3. Walk over. *Third Heat*: W. Mott (16 yds.), 1; A. P. Slingsby (15 yds.), 2; A. Middleton (16 yds.) 3. Time, 23 secs. *Final*: W. Mott, 1; A. P. Slingsby, 2. Time, 21 secs.

HALF MILE (OPEN).—H. T. Watson, 1; K. McDiarmid, 2; H. Archer, 3. Time, 2 min. 26 secs.

HURDLES.—*First Heat*: M. P. Knubley, 1; C. A. Cooke, 2. Time, 20 4-5th secs. *Second Heat*: E. Lees and K. McDiarmid, walk over. *Final*: K. McDiarmid, 1; E. Lees, 2; C. A. Cooke, 3. Time, 20 secs.

THROWING CRICKET BALL.—H. Fellowes, 85 yds. 2 ft. 4in.; J. Poore, 82 yds.

PUTTING THE WEIGHT.—G. Lyon, 29 ft. 9 in.; H. Fellowes, 27 ft. 9 in.

THREE MILE RACE.—J. E. de G. Henniker, 1; H. Archer, 2; K. McDiarmid, 3. Time, 16 min. 34 secs.

BICYCLE EGG AND SPOON RACE.—*First Heat*: E. Lees, 1; G. Lawson, 2. *Second Heat*: E. W. Amsden, R. C. Mankowski, dead heat. *Third Heat*: H. T. Watson, 1; A. C. Anderton, 2. *Final*: A. C. Anderton, 1; E. Lees, 2.

THREE LEGGED RACE.—*First Heat*: Deane and Lees, 1; Henniker and McDiarmid, 2. *Second Heat*: Slingsby and Fellowes, 1; Iredale and Archer, 2. *Final*: Deane and Lees, 1; Slingsby and Fellowes, 2.

QUARTER MILE.—P. J. Murray, 1; W. Mott, 2. Time, 59 1-5th secs.

WALKING RACE (2 Miles).—J. E. Geoghegan, 1; E. Iredale, 2; R. C. Mankowski, 3. Time, 18 min. 21 secs.

THROWING THE HAMMER.—H. Fellowes, 70 ft. 6 in., 1; R. C. Mankowski, 70 ft. 3 in., 2.

MILE (Open).—J. E. de G. Henniker, 1; H. Archer, 2; K. McDiarmid, 3. Time, 5 min. 6 2-5th secs.

SACK RACE.—M. P. Knubley, 1; H. Blaker, 2.

HIGH JUMP.—C. A. Cooke, 5 ft., 1; E. Lees, 4 ft. 10¼ in., 2.

HALF-MILE HANDICAP.—W. Mott (60 yds.), 1; Chell (50 yds.), 2; H. Archer (5 yds.), 3. Time, 2 min. 14 secs.

TUG-OF-WAR.—The In-Students won the first pull in 21 3-5th secs.; the second in 35 secs.

CONSOLATION RACE.—C. M. Dobson, 1; L. B. Akers, 2.

R.A.C. COLLEGE SPORTS RECORDS. (From 1870.)

Event.	Time or Distance.	Holder.	Year.
100 Yards	10sec.	W. Swindell	1873
		H. Pelham Clinton	1882
		C. Cook	1899
Quarter Mile	52 3-5ths sec.	H. M. Lee	1893
Half Mile	2min. 10sec.	H. Pelham Clinton	1882
Mile	4min. 46sec.	C. H. Glass	1876
Three Miles	16min. 34sec.	J. E. de G. Henniker	1904
Walking, 2 miles	16min. 43sec.	B. Ferguson	1870
High Jump	5ft. 4in.	G. H. Heath	1881
Long Jump	21ft. 4½in.	T. Paget-Tomlinson	1900
Hurdles, 120 yards	17sec.	H. K. Norris	1875
		G. A. R. Chamberlain	1895
Throwing Cricket Ball	110yds. 1ft. 11in.	A. S. Reed	1885
Throwing the Hammer	86ft. 2in.	T. A. Scully	1903
Putting the Weight	33ft. 9in.	J. H. Oakley	1886

OLD STUDENTS.

Mr. Edric Druce, M.R.A.C., has been appointed Principal of the County Agricultural Institute, Rigmont, Aspley Guise, R.S.O., under the control of the Bedfordshire County Council. This was formerly the Woburn Farm School, but has been re-organised.

Mr. Herbert Bowman Beddall, M.R.A.C., obtained the National Diploma in Agriculture, on the results of the last examination held in May, 1903, granted by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland.

DIPLOMA EXAMINATION.

At the close of last Session, Christmas, 1903, the following gentlemen obtained the Diploma of Membership: Mr. H. G. Browne, Mr. C. J. T. Sherston, B.A., Mr. B. Blackbourn, Mr. R. Bygott, and Mr. J. P. Cullen. Mr. Browne obtained a Gold Medal, and Mr. Sherston a Goldstand Silver Medal for special distinction in veterinary subjects. An Associateship of the R.A.C. was given to Mr. Nicholas Robinson; and Mr. D. Dowden Elliott gained a Certificate of Proficiency in Practical Agriculture.

The external examiners were—In Practical Agriculture, Mr. W. P. Allsebrook; in Agricultural Chemistry, Dr. J. A. Voelcker; in Land Surveying and Engineering, Prof. H. Robinson, M.I.C.E.; and in Veterinary and Bacteriology, Prof. Sir George T. Brown.

SCHOLARSHIPS.

The first and second Scholarships were, last term, divided between E. B. Lees, B.A., and Hugh S. Mathews, and the third Scholarship was awarded to Cyril Annesley Cooke.

CHLORINE IN RAIN WATER.

The rainfall for the six months ending September 30th, 1903, was 21·38 inches, on 93 days: it contained chlorides equal to ·245 grains of sodium chloride per gallon, that is equivalent to a deposit of 16·87 lbs. of common salt per acre. The rainfall for the twelve months ending at the same date was 37·33 inches, on 193 days; and the chlorides equal to 40·45 lbs. of common salt per acre for the year.

The rain falling on June 14th and 15th, 2·06 inches, with a strong N. and N.E. wind, contained chlorides only equal to ·17 grains of sodium chlorine per gallon, considerably below the average of the six months. E. K.

R.A.C. POINT-TO-POINT STEEPLECHASES.

This event which has been in abeyance the last few years is now revived, and as we go to press, Saturday, April 9th, what promises to be a very successful meeting is being held at Woodmancote; the course being on the farm of a late student, Mr. Robert Stuart. We will give a notice of the results in our next issue.

At the Point-to-Point Races in connection with the V.W.H. (Cricklade) Hunt, held in Wanborough Vale on Thursday, March 31st, there was a race open to students of the R.A.C., ridden by owners. Mr. G. Lawson's Red Ruth was first, and Mr. E. Lee's Hector second. Mr. Slingsby and Mr. Deane also rode.

FOOTBALL.

RUGBY.

R.A.C. v. SWINDON.—This match was played on February 13th at the R.A.C. The ground was in a very bad condition from incessant rain. The first half was very even, neither side scoring. There was a marked improvement in the College scrum on the form of last session. The three-quarter line too was better in spite of the loss of Prof. Woodley. In the second half Swindon pressed and succeeded in scoring two tries, one of which was converted. It will be remembered that in the previous match Swindon had beaten us by 30 points, but their team was slightly stronger. This result gave promise of a more successful season. Final score: 8 points (1 goal 1 try) to 0. The College team was: E. C. Barker (back); H. T. Ward, R. C. Mankowski, A. S. White, K. McDiarmid (three-quarters); P. J. Murray, H. S. Mathews (halves); A. C. Anderton, J. Deane, H. de B. Archer, E. F. Longcroft, J. Geoghegan, H. S. M. Fellowes, D. Frier, and J. M. Spurrier (forwards).

R.A.C. v. STROUD ATHLETIC.—Played at Stroud on February 20th. This match was disappointing, seeing that last session they won by only 3 points. The forwards were about equally matched, but outside the scrum we were completely outmatched, and were unable to prevent them from scoring 6 tries. Final score:—R.A.C., nil; Stroud Athletic, 1 goal, 5 tries.

R.A.C. v. MAGDALEN COLLEGE.—This match was played at Oxford on Wednesday, February 24, but the R.A.C. was handicapped by the loss of Deane and Longcroft, who were unable to play for the rest of the season. In spite of this the forwards played a very good game, and often held those of Magdalen College. The pace and combination of the Magdalen three-quarters enabled them to score 7 tries, of which 2 were converted, while the R.A.C. scored 1 try. R.A.C. 3 points; Magdalen College, 25 points.

R.A.C. v. BERKSHIRE WANDERERS A.—In this match which was played at Reading on Wednesday, March 2, the R.A.C. was assisted by Sivright, who greatly strengthened the scrum. It rained throughout the match, and the ground was very wet. The Berkshire Wanderers pressed hard, and after a series of rushes scored a try that was not converted. After this the R.A.C. had the best of the game, and shortly before half-time scored a try which was not converted. In the second half both sides were very evenly matched, and neither side succeeded in crossing the line. Final score:—R.A.C., 3 points; Berkshire Wanderers, 3 points.

R.A.C. v. ST. PAUL'S COLLEGE.—This match was played at the R.A.C. on Saturday, March 5. The R.A.C. forwards attacked for most of the game, but in spite of keeping the ball in their 25 for the greater part of the game, the R.A.C. only succeeded in scoring one try, which they failed to convert, while St. Paul's College scored two tries, obtained by getting clear away from one end of the field to the other, and both of which were converted. The visitors also scored a drop goal. Final score:—R.A.C., 3 points; St. Paul's College, 13 points.

R.A.C. v. NAUNTON PARK.—This match was played at the R.A.C. on Saturday, March 12, and was very evenly contested throughout. In the first half the game was very even, neither side scoring. In the first few minutes of the second half Naunton Park scored between the posts, which was converted. After this the game was again very even, but near time by some good three-quarter work the College scored a try, afterwards converted, thus equalising the score. In this match there was marked improvement in the combination of the three-quarters. Final score:—R.A.C., 5 points; Naunton Park, 5 points.

R.A.C. v. CHELTENHAM GORDON LEAGUE.—Played at Cheltenham, on Saturday, March 19. This was the last match of the season, and resulted in a win for the College by 4 points. Almost immediately on starting our opponents scored a try, but after this the R.A.C. played up, and the game was even. After a series of rushes the R.A.C. scored. In the second half the game was again very even, each side scoring two tries, but Cheltenham Gordon League failed to convert, while both of ours were converted by Sivright. The whole team played better together than they had done throughout the season. Final score:—R.A.C., 13 points; Cheltenham Gordon League, 9 points.

The following played for the College during the session:—E. C. Barker, back; H. T. Ward, R. C. Mankowski, A. White, and P. J. Murray, three-quarters; H. S. Mathews (captain) and K. McDiarmid, halves; A. C. Anderton, J. Deane, H. Archer, E. F. Longcroft, J. Geoghegan, H. Fellowes, D. Frier, and E. W. Amsden, forwards. The following also played:—J. Bettel Sivright, E. Gamlen, H. C. Bell, J. M. Turner, and J. M. Spurrier.

R.A.C. BEAGLES.

The beagles have just concluded a most successful season, which has been one of exceptionally heavy going for those who follow them on foot. The pack has been strengthened by the inclusion of 3 couple of hounds, purchased from C. Sherston, Esq., M.R.A.C. They have accounted for four brace of hares since Christmas, after some exceptionally fast runs. The kindness with which they have been entertained by landowners and farmers has contributed much to the success of the season, and has made the task of arranging the meets an easy one. The most successful meets in point of numbers were at Bibury Court, Maisey Hampton, and Woodmancote, whose owners are so justly celebrated in ministering to the wants of the inner man. On Saturday, 9th April, we were glad to entertain those through whose kindness we have been enabled to hunt over so large an area of country.

The retiring Master wishes to take this opportunity of thanking all those who have so kindly supported him, wishing the pack all success in the future.

GOLF.

The return match against Sapperton Park was played at the R.A.C. on Saturday, 19th March, and resulted in a brilliant victory for the home team by 7 matches to 1. Scores :—

R.A.C.		Sapperton Park.	
E. B. Haygarth	0	J. Rawlins	0
Prof. Paton	1	E. C. Cripps	0
Prof. Locke	1	E. C. Sewell	0
Prof. Blundell	1	W. G. Tovey	0
G. E. Morrison	1	R. J. Mullings	0
E. C. Villiers	1	A. H. Gibbons	0
Prof. West	0	Patrick Smith	1
H. G. Berkeley	1	W. H. Cole	0
K. McDiarmid	1	A. Stradling	0
	7		1

The Senior Challenge Cup was won by Mr. C. A. Cooke making a nett score of 79 with a handicap of −10, Prof. Paton being second with 81, scratch. The Junior Cup was won by G. Lyon making 80 nett, handicap −18, R. Swanwick being second with a nett 81.

BILLIARDS.

The following gentlemen entered for the American Billiard Handicap of 200 up :—

Prof. Paton	scr.	E. B. Hudson	65	G. M. Dobson	85
Prof. Locke	10	T. L. Sulivan		J. Deane	
Prof. West		A. E. Solignac	75	T. F. Hedley	90
R. C. Mankowski	20	E. C. Villiers	80	W. D. Stevens	
H. Middleton	50	W. F. Mott		H. S. M. Fellowes	100
H. S. Mathews	60				

First prize, T. L. Sulivan ; second prize, A. E. Solignac ; third prize, H. S. Mathews.

REVIEWS.

MANUAL OF FORESTRY. Vol. 2. SYLVICULTURE : by W. Schlich, Ph.D., F.R.S., &c. ; Honorary Professor of Forestry, R.A. College. London, 1904 : Bradbury, Agnew & Co. Third edition. 8s. net.

That three editions of this work should have been required since 1891, the year of the publication of the first edition, is clear proof of the interest that is now being taken in Dr. Schlich's efforts to further the more general adoption of proper sylvicultural methods in the management of British and Irish woodlands. That his efforts have met with a measure of success is also evidenced by the action of the College authorities here with regard to forestry, and by the fact that probably in a short time our young farmers at our different county agricultural colleges will be enabled to add a course of forestry to their already existing comprehensive courses on estate management and farming. No one possesses equal qualifications to Dr. Schlich in dealing with this subject. He has shared with Sir Dietrich Brandis the responsibility of the organisation of the system of

THE LIBRARY OF THE
DEC 4 - 1930
UNIVERSITY OF ILLINOIS

management that is now followed in the forests of our Indian Empire. He has a close personal knowledge of all the principal continental forests, and himself owns and directs the arrangement of an extensive forest range in Belgium. The volume before us deals with the different forest trees and their development: the character and composition of woods: the formation and after-tending of woods: and the different systems of management. The information given is directly applicable to our home woodlands (although originally written as a text-book for Indian forest students), both to the smaller areas under forest crops such as exist on most estates, and also to the wider questions of planting up waste lands, and those worked out areas of our coal and iron districts which might beneficially from every point of view be put under a timber crop, judging from existing woods, here and on the continent, on old disused pit-banks and spoil-heaps. Of special interest to those acquainted with our home woodlands and their management, are the chapters dealing with the suitability of species for the locality, the raising of young plants in nurseries, in which there is much room for improvement in this country, and the chapter on thinning, which, however, we should have liked to have seen dealt with more fully. The volume is well printed, with some useful illustrations, and an excellent index; and should be in the hands of all forestry students as their chief text book. It should also prove of great value to the land-agent, on whom, more often than not, rests the decision whether operations in the woods under their charge are to be properly or improperly carried out.

Variation in the Milk of a Dairy Herd during the Summer Months. By T. S. Dymond and B. W. Bull. County Technical Laboratories, Chelmsford, Essex, March, 1904.

In a former paper, published last year, the authors pointed out the causes of variation in the quantity and quality of the milk yielded by the Cows of a small herd of Shorthorns fed on winter rations. It was shown that whilst various factors influenced the result the chief variations were due to the idiosyncrasies of each cow: in their experimental herd there was only one cow whose milk never fell below the limit of fat and solids-not-fat fixed by the Board of Agriculture; but by mixing the milk of all the cows of a herd there is little danger of the milk falling below the limit of quality. It was determined by the Essex County Council Education Committee to continue the experiment during the summer months on the same cows, six in number. The observation lasted from May to September, and the cows, which were out at grass, received during milking 3 lbs. of undecorticated cotton cake daily. The figures show a rapid falling off in the quantity of milk as the summer advanced, more than can be due to the advance in the period of lactation of the cows, and no doubt partly due to deterioration in the quality of the grazing: the falling off amounted to about 10 per cent. per mensem. As the milk decreased in quantity the percentage of fat nearly always increased, but there was no regular increase in the percentage of solids-not-fat, and there was in the case of every cow a *decrease* in percentage in these in July. One cow only never yielded milk with fat below the limit, but in the case of four of the cows the solids-not-fat was never below the limit, though in the other two it was often below. When the milk of the herd was mixed it never fell below the limit in quality. When a cow is in season an extraordinary change occurs both in the quantity and the quality of the milk for a short time. At first there is a great falling off in the yield of milk and this is very deficient in fat, containing less than two per cent.; but in twenty-four hours or less the yield of milk increases and for one or two milkings becomes very rich in fat, five to six per cent. The solids-not-fat are not affected. With the flush of milk in the spring there is a decrease in the percentage of fat and also of solids-not-fat; as the supply diminishes the quality gradually improves. The authors rightly insist on the desirability of the dairy farmer ascertaining the quality of milk each cow is giving, not only that he may be able to mix the milk judiciously so that it may never be sent out below the limit of quality, but also that inferior cows may be weeded out and never used for breeding.

Extract from
The R.A.S. of England Journal.
Vol. II. of Series 3, page 192.

"Permanent & Temporary Pastures."

By MARTIN J. SUTTON, F.L.S.

"THE book is, in its entirety, a happy illustration of 'Practice with Science.' Primarily, it is a practical book written by a practical man for practical men. But Science, as the handmaid of Practice, sheds her light upon its pages, and the result is in the highest degree instructive. The early chapters deal with the drainage of grass land, cultural preparations, and the selection of grasses and clovers. The main part of the book is then occupied with descriptions of the species of plants commonly found in meadows and pastures. Next follow instructions for the spring and autumn sowing of grass seeds and the immediate after-management of new pastures."

Sixth edition, bound in cloth, 5s.

Thro ll Books

SIMPKIN, MARSHA

Or may be obtained dir

Printed and Published for the Propri
Lewis Lane,

UNIVERSITY OF ILLINOIS-URBANA
3 0112 122879346